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THE LAND
NOW AND TO-MORROW

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The Hill Lands of Britain

A Survey of the Agricultural and Waste

Lands of Wales

The Plough-up Policy and Ley Farming



Contemplation

■

THE LAND NOW AND TO-MORROW

by

SIR R. G. STAPLEDON

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24 Russell Square

To
DORIS WOOD STAPLEDON
who since I came into Wales and devoted
myself to the study of grassland and of
rural conditions has motored me over
200,000 miles and frequently into the
most inaccessible places.

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PREFACE TO THIRD EDITION

In this edition it has seemed desirable to re-introduce the chapter on 'My National Park', which, when the book was first published in 1935, was supported by two descriptive maps. It is now impossible to reproduce the maps, and I have, consequently, re-written the chapter in a manner that will be intelligible without the support of maps.

The thesis of a national park as I envisaged it would seem to me to have gained in importance since I first propounded my ideas, and in the chapter as I have re-written it, I have enlarged a little on some aspects of the problem.

All the other chapters remain as in the first edition.

R. GEORGE STAPLEDON.

*Drayton Manor,
Stratford-on-Avon,
February, 1944.*

P R E F A C E

At first I had intended to write about the land in its agricultural implications only. To-day, however, that is not enough, for the land must be considered in relation to the nation as a whole.

We have to take into account not only the relation of a prosperous country-side—which involves agriculture, forestry, and rural industries—to the national well-being, but also the question of providing facilities in the country and amidst truly rural surroundings for the recreation and relaxation of the urban population. Greatly daring, therefore, I have embraced the wider subject and have addressed myself to a consideration of land utilization from the national point of view. My excuse for going beyond the bounds of my own more intimate experiences and learning is solely that I conceive the subject to be of extraordinary importance. In this book, then, I am advisedly expressing views on what are no doubt highly controversial subjects, as well as talking in terms of what I believe to be well authenticated facts.

If to love the country, and to be friendly with and to understand country people, is to be prejudiced in favour of the country, then this book is written not without prejudice. Because I have lived by far the greater part of my life in the country, thought deeply and feelingly about the affairs of the country, and devoted myself to a critical study of particular agricultural problems, I believe there can be no doubt that my emotional reactions are to a very real extent the product of the country. If this is to be sentimental about the country, then this book may not be wholly devoid of sentiment.

What precisely is prejudice, and what precisely is sentiment in this connection? That is the point, and that is the question I would ask my urban-minded critic—who perhaps himself writes about urban and industrial matters from the national point of view, and with just as much of urban or industrial

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prejudice and sentiment as I am about to exhibit of rural sentiment and prejudice.

Sentiment and prejudice may be superficial or profound, according as they are the outcome of superficial or of profound feeling and experiences. If profound, there is perhaps more than a possibility that the emotion born of such sentiment and prejudice has about it something that is not only very real in the personal sense, but which is also true, and therefore significant, in the wider and national sense.

As I have said, my life has been spent wholly in the country, save for what was to me a rather colourless interlude at Cambridge, and save for a brief, but exhilarating, period spent largely amongst sea-faring men at a port of call on one of the busiest trade routes of the world. The result is that my own sympathies and outlook, I should imagine, are more akin to those of my ancestors, who were yeomen farmers, master mariners in the days of sail, and builders of wooden ships, than they are to those of the average educated man of the generation to which I happen to belong.

Therefore, because what would now generally be regarded as a somewhat old-world outlook may not be without value in relation to the solution of our modern problems and difficulties, some years ago I set myself to write a book on the lines to which I have now committed myself.

Unfortunately the writing has been a very long drawn out affair, for I have never been able to devote any prolonged and uninterrupted period to my book, which, for the most part, has been written in stolen moments of seldom as much as an hour at a time.

I have been too busily engaged on the land to write about it. I mention this because perhaps in this very fact lies the justification for the attempt I have made to marshal my views on what has become an urgent national problem. The reader, however, must decide whether this justification is sufficient to excuse an author for presuming to express views although painfully conscious of the fact that insufficient indoor study and insufficient contemplation have contributed to the views as such and to the manner of their presentation.

I have received the greatest help and all the information I

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have sought from the secretaries of a number of organizations concerned with amenities and recreation, and from Government departments and other public bodies. I am particularly indebted to Sir Lawrence Chubb for information relative to playing fields and commons; to Mr. Lindsay, Chief Staff Officer of the London Passenger Transport Board; and to Mr. R. B. Dawson, Director of the Greenkeeping Research Station at Bingley. To these, and all of those, too numerous to specify, who have in many different ways so generously assisted me, I offer my sincere thanks.

For experiences gained relative to the acts of reclamation I am deeply indebted to Captain R. T. Hinckes of Foxley, Hereford; to Captain G. L. Bennett Evans of Mânod, Llangurig, and to Mr. S. M. Bligh of Cilmerly Park, Builth Wells, with all of whom I have been in close association for a number of years; while both Captain Hinckes and Mr. Bligh have given me valuable information relative to the costs of their undertakings. I never write or think on country and agricultural matters without realizing what I owe to my friend Mr. Bligh. He is a veritable volcano of ideas, and a pioneer practitioner in the art of land improvement. I have been intimately connected with him too long to be able to disentangle my own ideas and views from his. The evolution of my national park—a dream park though it be—owes almost everything to Mr. Bligh, though I hasten to add that his dream park would no doubt be very different from and vastly superior to mine.

I am particularly indebted to Mr. Allan of Auchinleck Farm, Newton Stewart, for allowing me to give particulars of his interesting reclamations in Scotland, and for the information with which he has so kindly furnished me.

Lord Sempill and Mr. C. P. Hunter have given me valuable information relative to aerodromes and landing grounds, for which I am exceedingly grateful. I am equally grateful to Mr. G. T. Barham for particulars relative to the city cow, and to Mr. Reginald E. C. Beale and Mr. C. A. Clark for facts and figures bearing upon the cost of laying out playing fields.

I have drawn heavily upon the goodwill and energy of my staff in the writing of this book. Mr. H. G. Chippindale has been wholly responsible for making the survey and collecting the

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information, as well as for the greater part of the design of my hypothetical national park. Mr. William Davies has freely placed at my disposal his intimate knowledge of vast areas of hill and grazing lands in Wales. He has also conducted numerous special surveys in England as well as in Wales and prepared a number of detailed memoranda for me frequently at very short notice; in addition to this he has given me invaluable help in the revision of my technical chapters. Mr. Moses Griffith, with the assistance of Mr. P. M. G. Hutton, has prepared and tabulated all the information I have drawn upon from the Cahn Hill Improvement Scheme; while Mr. Griffith has also given me much valuable assistance in other directions. Mr. M. T. Thomas, Mr. Gwilym Evans, and Mr. W. E. J. Milton have also been responsible for the preparation of masses of tabulated data; to all these colleagues I offer a full measure of thanks.

I have been a continual source of worry to scientific friends, and in particular have to thank Professor K. W. Braid, Dr. E. M. Crowther, Mr. John Dunlop, Mr. John Orr, Colonel R. Peel and Captain W. Price.

I should never have been able to tidy up my manuscript had it not been for the inexhaustible patience of my stenographer, Miss Irene D. Rees, while I could not have seen this book through the press without the invaluable assistance of Mrs. Taylor and Miss R. Peter Jones, to all of whom I am much indebted.

My gratitude to my wife is unbounded; she has read and re-read all my pages, and throughout she has been my ready-reckoner and my dictionary.

I should perhaps point out that I worked up my main statistical and scientific evidence in the early months of 1934, and subsequently I have had no opportunity of re-casting my figures in sympathy with more recent data. To have done so, however, would in no wise have affected my conclusions.

R. G. STAPLEDON.

*Lluest,
Llanbadarn Fawr,
September 1935.*

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Plan representing 1,920 acres of farmlands in the neighbourhood of Ammanford. The excessive proportion dominated by *Molinia* and *Nardus* is typical of much of this area *to face page 72*

•

‘This blessed plot, this earth, this realm, this England.’
—*Richard II*, Act II, Scene I.

CHAPTER I

The Argument

The culture of a nation and its land surface. The land a factor of environment; land-mindedness. The England of Queen Anne and the England of to-day. The nation's coefficient of ruralicity. The urban worker and the land; the love of nature; escape from mental contact with human beings. The various claims on land. Influence of working hours; the long week-end. Catering for posterity.

THE culture of a nation by general consent, would, I suppose, be regarded as its greatest heritage, but a heritage perhaps equally worthy of being cherished is the land surface which a nation occupies. The culture to a large extent must have been influenced by the character of the land surface, and in any event culture and land surface are interwoven, and interreact in countless directions difficult to unravel.

For better or for worse a nation may endeavour to mould and to develop its culture along definite and pre-conceived lines. In whatsoever direction the national character and the nation's activities move, the land surface and the use to which it has been, and is being put, will be the mirror which reflects the devious paths which a people have trodden in search of self expression. Whatever may be said for the standard of culture of the British race at this juncture of our history, it cannot with justice be claimed that it is a culture which as such inculcates a love of the country, or demands an all-pervading spirit of carefulness and of respect for the way in which our limited land surface is used. This is the more surprising since a love of the country is strongly developed in numerous individuals. The beauty of rural England owes an immense amount to the thousands who maintain lovely gardens, and to the owners of woodlands and parklands, for despite everything a very large number

THE ARGUMENT

of such properties are still well-cared for. Nevertheless, the sad truth remains that a striking peculiarity of the extraordinary developments that have taken place, more particularly since the advent of the railway, has been the lack of vision and of forethought that the nation as a whole—and especially through Parliament—has displayed in regard to the ultimate fate of its land surface—its beauty and its potential value to the State.

There has been little thought for the future, and on this very account, and if biology and evolution mean anything, I would argue and to some extent, by implication at all events, I shall proceed to argue, that our culture is not of a very high order; indeed I consider it has about it much that is morbid, if not actually perverted. I am sure that if man looked at himself biologically, he would realize that, evolve as he may, he can never hope to be in a state of perfect equilibrium with his environment unless that environment satisfies his organism as a whole, and unless man lives in a state of equilibrium with his environment then man himself cannot be whole, inevitably he will be unbalanced. We have evolved not from a chemical retort, not from a laboratory or technical process, and not under the atmospheric and psychological influences of great cities, nor has *homo sapiens* been weaned on a diet of processed foods.

One hundred years, 200 years, 500 years in the life of a race (a nation) as of a species is as nothing. If man is to be true to himself, healthy and vigorous, he must find means, and means which savour not of perversion, to gratify all his urges and to meet all the demands of his physiological complexities. This he can never do if he persists in creating for himself environmental conditions which are not in harmony with the inexorable dictates of his genetical make-up. We tacitly assume all the time that acquired characters *are* inheritable; that would not be so bad if we did not also assume that even from the genetical point of view it took no time at all—less than 100 years—to acquire a character. We tacitly assume also that we do know all about the genetical make-up of man, all about his psychological and physiological demands on the habitat; at least if we do not assume this, we most certainly act, by default no doubt, as if on such an assumption. I believe, in short, that the problem of to-day is how to create environmental conditions for every one

THE CULTURE OF A NATION

of us that will cater not only for the sophisticated sides of our natures, but also and in equal degree for the animal, vegetable and primitive sides of our natures—the sides which I expect, no matter to what extent we have evolved in the much vaunted mental sphere, still contribute most to our make-up in its totality. In any event an environment that is only sophisticated cannot react properly on what is unsophisticated in us, and unless we are nourished all round, we as a species or as a race must either perish ingloriously, or become completely perverted.

I greatly fear that in the hurry and bustle of all this progress which has been based on applied science, we have not sufficiently studied the map of our own destiny, for surely just in proportion as we manipulate nature to our own ends with increasing skill and success, so ought we to be careful to return to nature itself for our further nourishment and inspiration.

To talk about returning to nature in the eyes of many people to-day is merely to be sentimental. The clever and more worthy ideal would appear to be to get away from nature and to make of nature our veriest slave, no matter how ugly, how distorted, we render the poor slave. It is, however, only by getting back to nature in our lives and in our mode of living that we can hope to use what we have enslaved to the true and enduring advantage of the species. From the how-to-live point of view, it is the simplicity, the severity, the silence and the beauty of nature that count, and to which somehow or another the lives of the whole well-nigh forty million of us (in England and Wales alone) have to be attuned. This I conceive to be the outstanding problem which faces the nation.

Contrast, for example, the England of Queen Anne with the England of to-day. What was the coefficient of rural-mindedness of the people of England then? And what is the coefficient now?

Trevelyan, in his delightful introductory chapters to *England under Queen Anne*, leaves us in no doubt as to the rural bias of Queen Anne's England. A nation of $5\frac{1}{2}$ million people, of which one-eighth were freehold yeoman farmers, and nearly as many more substantial tenant farmers—a quarter of the population actual farmers. More than that, money made in trade by land-owners themselves was constantly put into the land by these

far-sighted persons, and, as Trevelyan states, it was the interplay of the activity of town and country which gave to Queen Anne's England a fundamental harmony and strength, despite distracting antagonisms of sect and faction. This was an England which 'had the recipe for genius', and this was an England which also had an exceedingly high coefficient of land consciousness.

No doubt recent decades have produced their crop of geniuses—a very great many more should, however, have segregated out from the huge population of to-day than from Queen Anne's five-and-a-half millions. The fact remains that the present era is one of confusion—a confusion that is nowhere more apparent than in the use we make of the land surface of our little country. It may be argued that the problems of to-day are vastly more difficult than anything that presented itself in the reign of Queen Anne. Even so, there are to-day resources and knowledge—statistical evidences, for example—that were not previously available, while to-day we pride ourselves on being an educated people.

Unfortunately it is impossible to arrive at the coefficient of rural-mindedness of an industrialized and modern people. This coefficient, which might possibly better be termed the coefficient of rurality, is in the main a function of the precise extent to which a people as a whole have direct contact with nature. The extent to which they breathe uncontaminated air, the extent to which they eat unprocessed foods, and, for example, the chances open to them of getting a wet shirt in either their work or their play. It is a depressing thought to contemplate that there must be millions of people in England to-day who have never experienced the exhilaration of a thorough good drenching, and whose individual coefficient of rurality must be practically nil. More than one-half of us in England and Wales aggregated in 113 towns with populations of over 50,000, and practically a quarter of us in 13 cities, each with a population of over a quarter of a million, only about 20 per cent. of us living in rural areas, and only 6.6 of those of us who work actually working on the land and in connection with agriculture. All this must necessarily mean a disconcertingly low coefficient of rurality.

Bad as the position is, it is, however, not quite as depressing as the figures taken by themselves would imply. In the first place

THE NATION'S COEFFICIENT OF RURALICITY

agriculture, with which we may include the care of estates and gardens, is by no means the only industry which affords wholly rural employment. There is the industry of outdoor recreation in all its forms—hunting, shooting, golf, cricket, football, bowls—which, in the aggregate, affords a vast deal of outdoor employment, some of the employment, it is true, suburban, rather than truly rural, but all of it out of doors. Many of the great industries of the country also afford a really substantial amount of out of doors, or of partially out of doors, employment—this is true to a marked degree of transport in all its forms. Railway tracks and roads have to be maintained, to say nothing of the driving of trains and motor vehicles outside the urban areas. Then there is quarrying; and highly important, regarded purely in the outdoor and non-urban sense, the navy, the mercantile marine and the fishing industry, and to some extent the army. Even if, however, we make the highest possible allowance for the influence of all these employments on ruralicity, the nation as a whole must be regarded as being completely top heavy in the urban direction. The truth is, and it has to be squarely faced, the country has become the prerogative of the few—but those few are almost inarticulate in reference to the destiny of the nation.

The revolution that is already taking place in the national attitude towards nature and the countryside is, interestingly enough, being fostered in the towns rather than in the rural districts themselves. The urban worker is showing a determination to share with country folk, and to share with the more wealthy city man, the pleasures and beauties of the country. Witness the rapidly growing popularity of camping, of cycling, and of walking. This I believe to be the greatest evolutionary development of the present century, and, if properly directed and abundantly assisted, herein lies the one gleam of hope for a nation that has lost touch with nature and with the land.

I am arguing in favour of a great return to nature on the part of the nation as a whole; I want to see the ratio of rural-mindedness to urban-mindedness, or perhaps I should rather say nature-loving-mindedness to urban-loving-mindedness, swung far far more in the direction of the former-mindedness.

The pendulum can be swung in the direction I desire by increasing to the maximum the amount of employment that can

THE ARGUMENT

be given by agriculture, and by all those other rural and pseudo-rural industries that I have mentioned. Assume, however, that everything that is possible has been done in that direction—that we have doubled and more than doubled our agricultural population, and that we are maintaining twice the road surface that we are at present maintaining, and that we have adopted every possible means to increase rural and quasi-rural employment: the nation will still remain too heavily weighted with urban bias.

The more formidable problem is, therefore, to bring the urban worker in closer contact with nature and with the countryside. When I say the countryside I mean unspoiled rural England, unspoiled untamed Wales, and unspoiled rugged Scotland—not urbanized seaside resorts and contaminated beauty spots.

There is no doubt that the love of nature is latent in every human being, and that essentially man is not only interested in his contacts with his fellows and in the products of human ingenuity and of human folly. The environmental conditions superimposed by huge cities and the urban mode of life have reacted predominantly on the gregarious side of man's nature, and have accentuated his tendency to act and think, not as a free and independent entity, but merely as a part of the herd. This is the line of least resistance, it is less trouble to be carried along with the crowd, and unconsciously to contribute to the mass psychology of the crowd, than to choose a path for one's self and to be guided by one's personal psychological reactions. The love of nature is in essence a personal reaction, for although we may be influenced, and are necessarily influenced, by what we may have read, and by those who may accompany us, in the last resort we are reacting to something in a sphere which is not just human, and the individual reacts most deeply when he is alone.

This urge to mingle with the universe and with life as a whole and not merely with the human species is latent in every urban dweller and shows itself in many ways. It shows itself in the desire to keep pets, to associate with species other than *homo sapiens*. The number of dogs (as estimated by those that are licensed) has increased in recent years out of all proportion to the population. The increase in population for England and

THE VARIOUS CLAIMS ON LAND

Wales has been 5 per cent. for the intercensal period 1911-1921 and 5·4 per cent. for the period 1921-1931. The number of licensed dogs in Great Britain for 1931 was returned as 2,924,332, being an increase of 55 per cent. during the ten years since 1921—a rate of increase which was no less rapid during the period 1901-1921. The reaction of every individual to his dog, or his cat, is essentially a personal reaction; it is to a very large degree unaffected by mass psychology. There is a deep significance in the very fact of the enormous dog and cat population of every town; there is a deep significance in the fact that so many workers in the mines and factories are expert fanciers; there is a deep, though rather pathetic, significance in the window boxes of those who dwell in mean streets. The dog, the cat, the pigeons, the window box, or the minute little garden patch all afford some measure of escape from the baneful influences of an exaggerated mass psychology—an escape from the everlasting mental contact with other human beings. The country provides not only for air and exercise, but properly appreciated and properly used it has much to contribute to the culture of a nation.

I am concerned primarily with the proper utilization of the land surface of Great Britain, and it seems to me that the first thing to be decided is the priority of the innumerable claims that a modern state makes on its land surface. When a country is vast and the population small, the question of the priority of claims hardly arises; but in these small islands the matter is of extreme urgency. If we take any long view of the case there is obviously not an inch of land to spare, and it is an outrage on posterity to misuse a single yard of land—the outrage has been more than sufficiently perpetrated already. True, a decline in population is definitely in sight and may be expected to continue, but who can prognosticate for how many decades or centuries such a decline will in fact continue? The question of birth control is many-sided with extraordinarily far-reaching psychological and genetical implications, which no scientist living would at present claim definitely to understand. When science can establish beyond question the optimum size of family compatible with the physiological and psychological well-being of all concerned, and compatible also with the highest

mulish hybrid. All this would be planned, and at the worst could hardly be as wasteful and as futile as uncontrolled ribbon development, but it would be to urbanize the whole country, and for the nation to fall completely under the spell of mass psychology.

On the week-end policy the great towns could be kept within reasonable dimensions, and the country maintained in a predominantly rural condition. The worker would contrive to live near his work, but to a very large extent would go into the country for his recreations, and by that much would be partially de-urbanized.

No matter what basic principle is adopted in the planning of town and country, whether the worker is taken a considerable distance each day to his work, (the huge 'garden' city), or a much greater distance at the week-end for his recreation, everything will depend on the excellence and cheapness of the transport facilities. Within the confines of Great Britain distance *qua* distance means little or nothing nowadays; cheapness and facilities mean everything.

Again, even if the short day and the garden city become the reality, the week-end and the summer holiday would still have to be provided for, and for the masses, who are already beginning to take matters into their own hands.

Every suggestion that I shall put forward is on the major assumption that a strenuous endeavour will be made to keep town and country as distinct as possible, and with the earnest hope that the short working week will finally come to be adopted.

I have, therefore, taken the week-end and the summer holiday as my basic principle. I am not supposing that working-class families will be able to stay away from home every week-end, but I am far from supposing that all the members of every family will stay at home every week-end. Moreover, if a man or a woman, or a whole family have the whole day available for recreation, they can go very much farther afield than if only an evening or an afternoon were available. Most important of all, people will always contrive to utilize facilities and avail themselves of what is provided for them.

Immediately outside the 'city wall'—and would that we still had city walls—provision should be made for an enormous

CATERING FOR POSTERITY

acreage of playgrounds, grounds for the team games. Farther afield, golf courses. Farther afield still, week-end villages, camping grounds and national parks. The background a prosperous and well ordered agricultural industry, and a rural England still essentially rural.

That is my theme, the country aspect of catering for posterity. As to the planning within the city walls and the amount of extension that is necessary or desirable, that is not a subject upon which a countryman can presume to express opinions. He is, however, entitled to hold to the belief that it would be a sad day for England, a fatal blow to the culture of the nation, if town and country were permitted to merge in a vigorous hybrid growth, which would inevitably devour practically the whole land surface of Great Britain.

CHAPTER II

The Agricultural Background

A vigorous agriculture, the first necessity. The land more important than what it grows. Interest in the land itself begets enlightened farmers. Flexibility in farming and national crises. The importance of fresh food. Agricultural policy in relation to the products of the land, the tillers of the land, and the land itself. The dangers of excessive specialization. Permanent grass retards enterprise and progress. The influences of hunting. The wide variability of grassland. Sub-normal fields, their effect on ordered marketing; their relative abundance. The spirit of the land.

I propose to deal with the agricultural aspects of my subject, though they are not in themselves necessarily the most important, before embarking upon the more difficult question of catering for urban recreation in the country. I hold the view very strongly that if town dwellers are to derive the maximum of stimulation from a closer contact with the country it is essential that the agricultural and other rural industries should be pulsating with vitality.

Agriculture must necessarily, therefore, form the background to any endeavours that may be made to bring the nation as a whole into closer contact with the country. The essence of nature is ebb and flow, change and creativeness; farming, no matter to what extent it may become industrialized and mechanized, can never escape from the seasons, and must ever deal first-hand with nature and with life. In consequence, agriculture, above all other industries, to be true to itself and in harmony with the forces the farmer sets out to manipulate, must be conducted in a spirit of enterprise and in a spirit of creativeness.

In order to engender a healthy creative spirit, I believe there is nothing to match concentration on the land itself—a keen

VIGOROUS AGRICULTURE THE FIRST NECESSITY

desire to care for the land and to maintain the land in good heart. The farmer who is entirely independent of bought-in manures and bought-in feeding stuffs is compelled to take heed of his land—and to farm.

In the absolute sense there are no such farmers in this country to-day; but the enterprising farmer and the man with the broadest outlook, and the man who is the greatest national asset is without a doubt he who ploughs, and he who conducts all manner of operations designed primarily to create and to maintain fertility.

From the national point of view I have not the least hesitation in asserting that it is the condition of the land itself that matters, infinitely more than what any particular parcel of land may happen to produce over any long period of time. I say this for two reasons; the first, because the quality of the farmer himself is of greater national value than the particular wares he may have for sale either this year or next, twenty or fifty years hence. My second reason—which is fundamental—is that in the realm of material things the function of British agriculture is to save the nation from starvation in times of emergency and crisis. The more able and creatively-minded the farmers, and the higher the state of fertility of every available acre of the land surface of the country, by that much longer will the nation be able to withstand a siege, and by that much more quickly will the nation be in a position to adjust its methods of farming to unpleasant necessity.

I am no war-monger, and I believe it is the duty of every peace-loving person never to mention the word war, but nevertheless hard facts must be faced—faced in as quiet and unostentatious a manner as possible. The fact is generally completely overlooked, moreover, that catastrophes nearly as great as war can still sweep over vast surfaces of the globe, and that a country over-dependent on imported food might at any time find itself with certain shelves in its larder almost completely bare.

There are still people who argue that in any event we could never produce a sufficiently large amount of food in this country to meet a prolonged period of shortage, so that there would be no point in organizing our agriculture with a view to the

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possibility of a food crisis. To argue thus is to fail to discriminate between a partial and a complete stoppage of imported foods, and not sufficiently to realize the immense amount of food that can be produced per unit of area under highly intensive methods, and not to give sufficient weight to a change in dietary as an additional safeguard in an emergency.¹

My own view is that nobody has the least idea of how much food this country could produce if the alternative were starvation. Our efforts in the last crisis are no criterion at all of what we could do even to-day, and still less of what we could do a decade or two hence. Last time we were caught out completely—a very small proportion of our land area was in a fertile condition, or suitable for crop production; few resources, limited knowledge, considerable dissipation of energy, large numbers of farmers ignorant of the art of cultivation—we had only begun to get into our stride when mercifully our endeavours became no longer necessary.

It is idle further to elaborate the matter or to quote statistics; all that is of yesterday, and we are only concerned with the future.

I repeat that what the nation should demand of its agriculture is flexibility—flexibility of outlook and the farm lands ready to meet any demands. All this is desirable, not only with a view to countering any sudden crisis, but also with a view to immediate adjustments in sympathy with changing world conditions. The unexpected is the only certainty in a world seething with unrest, and in an age driven headlong it knows not in what direction by the discoveries of science, and by the efforts at rationalization resulting from endeavours to apply the methods of science to the everyday affairs of mankind.

One has, for example, only to imagine the millions of China and of India desiring to live on the basis of a balanced ration, and being in a position to do so, and to imagine the demand per head for tobacco being as great in China as in Europe, to realize what colossal changes would rapidly be wrought in the orien-

¹In the matter of cereals, for instance (but man need not live on cereals alone), if the nation were starving, rye-bread—the food of our ancestors—would not come amiss. Rye can, of course, be successfully grown on a much wider range of soils than wheat.

THE IMPORTANCE OF FRESH FOOD

tation of production, and in the world movements of the fruits of the soil.

A change equally great would be brought about if it were proved beyond all shadow of doubt that freshness in food was of paramount importance to the health of a nation. We in Great Britain would hardly be able to feed all our population on fresh food produced at home, but just suppose that the electorate became insistent upon obtaining the maximum possible share of their daily ration in terms of fresh meat, liquid milk, new-laid eggs, home-made butter and fresh vegetables. Or even suppose that every human being in the country did in fact include some home-grown and fresh food in his daily diet, and this may be taken as having been proved to be essential to robust health. At any moment the findings of biochemistry and the researches of medicine might place evidence before the country which would be of such a nature as to cause a national outcry for the absolute maximum of home production. The land must be held in readiness to meet this, not at all improbable, contingency.

The duty of the State then is to make the care of the land the core of its agricultural policy—the land itself, a heritage we hold in trust for posterity, should assuredly come before every other consideration.

Manifestly, if the agricultural industry is permitted to go bankrupt the land must suffer, and will suffer too if marketing methods are chaotic and everything uncertain. It would be one thing, however, for the State to adopt measures designed to keep farmers solvent as a desirable end in itself—to rationalize marketing as a desirable end in itself—and quite another to adopt measures with a view to these ends, but as a primary consideration to employ only such methods as were bound to react favourably on the condition of the land. The policy actually adopted in the last resort must inevitably be different, according as the land, the products of the land, or the tillers of the land are deemed to be of the greatest national importance. I do not believe the nation as a whole, the great political parties as such, or for that matter the agricultural scientists, have ever fairly faced this issue.

To criticize Mr. Elliot's marketing schemes would be at once ungenerous and premature, but it would be both interesting

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and profitable to speculate as to their effect, immediate and ultimate, on the actual and potential productiveness and usefulness of the farm lands of the country. The production of milk can be made a highly intensive enterprise and an enterprise which carries in its wake the enhancement of soil fertility. Milk production, however, is all too frequently made the excuse for a method of farming which in its reaction on the land is disastrous, nothing more nor less. The acid test on my standards of evaluation, by which the Milk Marketing Board's activities should be judged—the judgment day must in all fairness be postponed a while—is its influence on the ratio land-spoiling to land-improving methods of production. Of the land-spoiling methods I shall have a good deal to say in a subsequent chapter.

From the point of view of the land, I am bound to confess that I view all these strictly *ad hoc* marketing and quota schemes, actual and potential, with some apprehension, and for this chief reason. The indications would seem to be that they are going to make for excessive specialization—specialization in milk, in eggs, in pigs, in wheat, and so on. Up to a point this may be all to the good: it would no doubt assist marketing, and therefore assist those responsible for the marketing schemes, and would probably be gratifying to the economists, but the economists should perhaps not be allowed to have it all their own way, for several reasons, but chiefly because they are exceedingly apt to ignore the land. Pigs, poultry, cattle, wheat, all have a part to play both in land improvement and in maintaining land in good heart. The essential point is, will they play their part as land improvers to the best advantage if segregated on specialistic farms, or if variously united on well managed mixed farms? This raises a question of far greater moment to the nation than the degree of prosperity of the individual farmer. In essence the control of the Marketing Boards has passed, or will pass, out of the hands of the State largely into the hands of the farmers. The Boards are primarily concerned with economics (and with products) and not with the land, and herein lies a germ which could conceivably develop into a very real danger to the State.

The wheat quota and the subsidy to sugar beet, although difficult to defend on many grounds, have it definitely to their credit that they react decisively on the land—they keep the

AGRICULTURAL POLICY IN RELATION TO THE LAND

plough moving and are conducive to arable farming. The art of good husbandry has undoubtedly derived a real stimulus from sugar beet production, which demands high farming, clean land, and, where necessary, resort to lime; a fact which has a special significance in relation to the land. Sugar beet influences the whole rotation; and most important of all, clean land and well ordered operations engender psychological ramifications which go far beyond particular farms.

Whether the money spent on sugar beet might have been better spent is another matter. Without attempting to answer this question, it will be very much to my purpose to consider in what other directions money could, with advantage, be spent to-day. There is but little room for doubt that the weakest link in the whole chain of British agriculture in regard to the care of the land, the quality of the farmer and the flexibility in the uses to which the land can be put, is the huge proportion of the country which lies in permanent grass; and I am referring now only to the definite farm lands, not to rough and waste grazings or to unreclaimed marshes and swamps. In the best interests of the nation, as I conceive these interests, a number of criticisms can be levelled against permanent grass, namely:

(1) It can be made to give a certain return with the minimum of care and attention—some return with practically no care or attention. It tends to stultify creativeness and endeavour. Whole farms, whole districts, in permanent grass mean that on such farms, and in such districts, the arts of cultivation and the use of the plough become extinct. There is no flexibility, and a material and mental vested interest has to be broken down before the plough and farming in the true meaning of the word can be re-introduced.

(2) Permanent grass, even under good grass, does not level out inequalities in the inherent productiveness of the soil to the same extent as rotational farming. Considered in terms of grass, and of the products of grassland, it would but seldom yield as much produce per acre as would the same land farmed on a rotation, with the long ley regarded as the pivotal crop.

(3) From the point of view of animal health, evidence is accumulating which tends strongly to suggest that temporary

grass is less liable to harbour and perpetuate disease than is permanent grass.

(4) Because some return and some rental can be obtained from even poor permanent grass, there is not sufficient incentive either to the farmer or to the landowner to initiate drastic improvements. A farm in permanent grass will give less employment than a well balanced mixed farm of the same size.

Far more is now known about the care of permanent grass than formerly, and under proper management it can be made more productive than had been supposed—but the same is true to even a greater extent of temporary grass, and in my view the above criticisms have been accentuated rather than the reverse by modern research, and by what modern research has made possible.

The problem of the better utilization of the land in permanent grass falls into three natural divisions. There is, firstly, the very best of this grass, which as such commands high rentals, and is held in almost reverential esteem. At the other end of the scale there is the worst—grass of almost negligible value, difficult as such to improve, standing for the most part on intractable clays, difficult to work, and inhospitable to man and beast. Between these two classes we have great areas in permanent grass that are neither very good nor very bad, that are as such capable of vast improvement, and that in the main stand on land which would yield easily to the plough. On national grounds there may be some excuse for tolerating great areas in the very best and very worst permanent grass: there can be no excuse for the intermediate areas, which to such a large extent occupy land admirably suited to mixed farming of a very high order, of that order which makes the greatest demands on the ingenuity and creative ability of the farmer.

I am not in these introductory chapters concerned with the technique of better farming or of land improvement, but only with the broad national aspects as I see them. On national grounds I am very unhappy about the large areas of land even in the very best permanent pasture. Here to a large extent we have land admirably suited to the plough and to cultivation, and, on the basis of present knowledge, capable of yielding to highly intensive methods. One reason for the reverential esteem

in which the best grasslands are held is the belief that if broken it would be exceedingly difficult, and at the best it would take a very long time, to get them back into first-class sward again. Such beliefs, particularly when interwoven with habit and vested interests—no matter what the evidence and the true facts—are incredibly difficult to counter. We have to remember in this instance that the larger areas of the best permanent grass have come to be regarded not only as the prerogative of the grazier, but equally, and perhaps to an even greater extent, as the prerogative of the hunting man.

The hunting man, together with sportsmen in general, in relation to the problems of land utilization, will be dealt with in the chapters concerned with the recreational needs of the nation. In the present connection there is this to be said about fox-hunting: the tendency to an ever-increasing extent is towards the management of permanent grass on intensive lines—this means fencing—so that inevitably and in due time the sportsman will be driven from the shires. I doubt if the fact that it is now perfectly feasible to establish 'permanent' grass of the highest possible quality at the first intention, by resort to the use of proper seed mixtures consisting of persistent and leafy strains of grasses, need therefore unduly worry the sportsman; although this may, and eventually probably will, lead to rotational husbandry—wire will prove to be his downfall in any event.

The farmer it is who should reconsider his position, and ask himself whether after all he might put even the lands of Northamptonshire and Leicestershire to better use than by leaving them wholly in permanent grass. From the national standpoint it is extraordinarily important that other and yet profitable means of using these lands should be devised, and means that would maintain them—because periodically ploughed, and because the arts of husbandry were being preserved and practised in the district—in a condition of flexibility, and ready to meet any national emergency.

Nothing would have served the interests of food production better during the war than a concentrated mass attack on the famous but albeit eminently ploughable pastures of Leicestershire and Northamptonshire. But because these pastures were deemed to be sacrosanct it was accounted almost blasphemous

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even to mention such a possibility, and to do so to-day in most agricultural circles would at least be met with derision. I have, however, long held the view that a system of farming pivoted on the temporary ley would be the right and proper system for a very large proportion of our best permanent grasslands. I am only partially entitled to hold this view. I know what vast possibilities have been opened up by the use of pasture- and leafy strains of grasses and clovers, but the large scale experiments I would wish to see tried in Leicestershire have yet to be conducted. And herein lies the whole point of my argument—the need for large scale experiments in the methods of farming. Those who advocate such experiments to-day, and there are many who do so, would plan their experiments with a view primarily to comparing the economics—the profits or losses, transitory in any event, and the plaything of an infinite number of variables—of the different methods: they would not bother about the land. Since the land is what matters, as I shall never tire of reiterating, the experiments should seek to hasten the evolution of methods of farming which hold within themselves promise of profit under anything approaching to normal conditions, and which progressively enhance fertility, and sustain the land, the farmer, and his equipment, in a state of preparedness for any eventuality.

The poorest pastures on the intractable clays constitute primarily a research problem, or rather it is the intractable clays themselves which constitute the problem. It is significant that the older agriculturists and the older agricultural writers concerned themselves much with these clays: now we hear little about them, the land to such a deplorable extent having ceased to be the care of the State, the landowner, or the farmer.

I cannot envisage any quota, any crop subsidy, any marketing scheme, having the remotest influence on the intractable clays. A direct subsidy on a two years bare fallow, well and truly performed, I should regard as an excellent means of spending money ear-marked for the benefit of the land.

There now remains the question of the great bulk of the permanent grass of the country, which occurs on all classes of soils, and represents the widest possible range in the matter of type and usefulness. To examine critically permanent pastures in all

THE WIDE VARIABILITY OF GRASSLAND

parts of the country is to be increasingly impressed by the fact that their degree of goodness or of badness, and their wide variability, are due even more to methods of management and of mismanagement than to variations in soil condition. Perhaps the most disconcerting property of these permanent grasslands, considered as such, is this very variability which shows itself as much from field to field as from farm to farm, and from district to district.

Variability is incompatible with a steady and ordered production of any commodity, and is incompatible with the marketing of products of uniform quality. Ordered marketing and centralized schemes of marketing to be completely successful are dependent to a high degree on a steady output of commodities of standard quality. The individual farmer in his own interest must therefore endeavour to bring the whole of his farmlands to a uniform standard of high productivity, while it is to the interest of a district where the farmers are producing the same products that the output of the whole district should be up to standard. The sub-normal fields and the sub-normal farms with their slovenly methods of breeding and care of livestock have to share the responsibility in being the prime cause of the wide disparity in the quality of the products of British agriculture. The scrub-bull has been taken in hand by the State—the sub-normal fields and farms present more urgent and more difficult problems, but since these problems appertain to the land they are left to solve themselves.

If for our present purpose we define a sub-normal field as being merely below the average of productivity of all the fields of the farm to which it contributes, and not as below the average of a standard to which the farm as a whole might easily attain, even so we should find the percentage of sub-normal fields extraordinarily high, especially on farms maintained predominantly in the somewhat poorer classes of permanent grass. It is no uncommon thing to find the sub-normal fields contributing up to 20-30 per cent. of the gross acreage of the farm. While if we take a 'reasonable standard' as our basis, the sub-normals will frequently exceed 80 per cent. of the acreage. On the poorer farms and in the poorer districts the tendency towards sub-normality is progressive; for rather than improve the poor fields,

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the farmer responds to a fall in milk yield or other adverse reaction of his stock by making very little use of the offending fields. When I come to discuss the technicalities of land improvement I shall particularize further as to this depressing state of affairs. Unfortunately, however, the remedy is not to be found by merely enlightening the farmer in the technical details to be followed. A fundamentally different system of management is necessary, involving the plough and an extension of the temporary ley. The actual and potential usefulness of what is the most easily improvable of all the farm lands of Great Britain is what the nation has at stake in this matter.

Would that spirits could talk, and we as a nation could hear the laments of the Spirit of the Land. We should be reminded how in the war we ploughed up thousands of acres of sub-normal fields to meet our then emergency, immediately to allow the fields to tumble back to grass, with never a helping hand and never a care for the land or the future. We should be given a doleful picture of the farmer watching the manurial residues from his cheap imported feeding stuffs pouring down the drain, and congratulating himself the while that he need no longer toil or till or concern himself with the noblest arts of husbandry—the conservation of fertility and the breaking-in of obdurate land. Bracken, bracken, bracken, oh, why all this bracken, scrub and rushes, water-logged fields and sluggish streams? But no, it is idle to lament, and spirits never die! what oxen had foreshadowed, the tractor can achieve, and the dream of the pioneer, the scientist can fulfil.

CHAPTER III

The Agricultural Background—*Continued*

Various agricultural policies. Land reclamation and the regionalization of the agricultural industry. Factors affecting regionalization. Localization, market gardening. Specialities and the possibilities of export. The up-grading of sub-normal farms and fields. Standardization of products on a regional basis; the need for land improvement. Haphazard use of breeds of stock and of varieties of farm crops. Re-conditioning farm equipment. A warning and a request to the reader.

I ended my last chapter somewhat abruptly and in a spirit of mingled optimism and pessimism. As my theme develops I would not care to prognosticate whether the optimism or the pessimism should prevail. Everything depends not upon the dreams of an individual, but upon the particular dream the nation sets the tractor and the scientist to fulfil, and upon the legislative and administrative stimulants with which statesmen will be willing to accelerate the nation's wish-fulfilment. Up to the present the dreams of the man-in-the-street in agricultural matters have never been psycho-analysed, while these dreams are few and far between, with the result that statesman, farmer and scientist alike have little to guide them.

A stunning import duty on feeding stuffs, the nation, and certainly the farmer himself, would never tolerate: it would cut across too many vested interests, would raise colossal difficulties in relation to industrial by-products, and would make it exceedingly difficult, though perhaps not impossible, to provide our dairy herds and fattening beasts with properly balanced rations. The farmer has already been de-rated and gratuitously so with the acts of good husbandry never so much as mentioned. It would certainly be possible, and ought to be feasible, to give some alleviation to the occupier-owner relative to income tax.

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Schedule B, by general consent, is both obscure and unfair, and puts definite hindrances in the way of the man desirous of effecting improvements.

I wonder if an economist interested in the land and well versed in the technique of controlled experiments—if there be such an economist—could devise a system of equitable and *ad hoc* subsidies for acts of husbandry and acts of reclamation undertaken rather to gratify the spirit of the land than with the hope of immediate profit.

I am digressing, for my immediate concern is to picture a rural England which I am firmly convinced it would be to the nation's interest to desire, and to endeavour to show that on technical grounds such a rural England could easily be made a reality. It can, of course, in cold fact only be made a reality, if both the State and the individual can obtain a fair return on the expenditure involved; and if neither the State (or the local authorities) nor the landowner (or the farmer) is crippled in the process. First the possibilities, however, and in later chapters I will produce evidence as to the costs of effecting improvements and the returns that may be expected.

Speaking broadly, as I have said, the huge area in permanent grass stands more to our discredit as custodians of the land than does any other feature of our agricultural practice—a feature that can only be remedied by a fundamental change in point of view. Bad arable farming and dirty arable fields can easily be rectified by a more disciplined attention to tactics; no questions of strategy are necessarily involved.

There remains to be considered that other very large acreage in Britain, which in its present unregenerate state is almost, if not quite, as indefensible as the permanent grass of the enclosed farm lands: I refer to the rough and hill grazings and to land in general calling for out and out reclamation.

In order to appreciate the importance and possibility of reclamation in relation to any agricultural policy based on a sense of duty to the land, it will be desirable briefly to discuss the fundamental question of regionalization.

The agricultural industry is already more or less regionalized, soil and climate have seen to that; but the regionalization, because to a large extent accidental, is only partial, is in no wise

REGIONALIZATION OF THE AGRICULTURAL INDUSTRY

purposeful, and is supported to a very variable, and on the balance to a very slight, extent by factory-collection and other facilities for the disposal of produce. Along with a more purposeful regionalization, contradictory as it may seem, a greater localization is also called for. We must bear in mind that such regionalization and localization as exist to-day, apart from the dominating effects of soil and climate, have been influenced by the fact that the railway and the horse, until but yesterday, constituted the only methods of transport. Hence to a large extent the localization of so much market gardening within a distance of an all-night horse journey from Covent Garden, while the train has tended to concentrate the great wholesale markets at comparatively few centres. The motor lorry has made it possible to cut across many of the tendencies that have grown out of the dominance of steam and the horse, while agricultural science to a very real extent has loosened the shackles imposed by soil and climate.

The whole question of regionalization and localization, therefore, demands the closest study in the light of these altered conditions. Broadly speaking, the actual systems of farming rather than particular products *qua* particular products have determined in the past, and should determine to an even greater extent in the future, the regional configuration of our agriculture. The localized configuration should be very much more determined by the products. The more perishable a product, the nearer should it be grown to the actual consumer. The whole excellence of soft fruit and vegetables turns on their freshness. Yet the supplies reaching even small towns come in overwhelming amount from the grower *via* a big wholesale market, and are of necessity stale before they are consumed. There exists an enormous scope for the ultra-localization of market gardening and fruit growing, while it is possibly only people who keep poultry themselves who know the true meaning of the term 'new-laid egg'. The great cities will always have to be dependent on truck and orchard districts, but the last word has not been said as to the localities that might usefully contribute to the production of fruit and vegetables to meet a larger than purely local demand; moreover, the consumption of fruit and vegetables *per capita* is generally considered to be far short of what is desirable

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more than the using of the various grades and conditions of land to the very best advantage—re-conditioning and reclamation. It implies also, as far as may be possible, a certain standardization of the products which will be marketed from every characteristic region. This, as I have said, is a strong argument for the re-conditioning and improvement of sub-normal farms and fields. It also affects the question of the varieties of crops, the breeds and classes of livestock, and the types of grassland. These are all matters highly personal to the farmer, and exceedingly difficult to stabilize and standardize over any considerable area—easier for countries producing for an export trade than for heterogeneous home markets. In some respects we are perhaps handicapped by our own successes, the number and the potential excellence of our breeds of livestock, for example. Greater standardization on a regional basis is urgently necessary in respect of livestock, and this is particularly so from the point of view of prime beef production, which, as my colleague Professor Ashby has pointed out, has suffered much from the dual-purpose animal, for beef animals (low-grade as such) to a large extent have become a by-product of the dairy industry. It is for the feeder and finisher to define clearly the type of animal he requires, and for the rearing districts to produce only the correct type. In this connection there exists considerable scope for purposeful regionalization, and for a greatly increased production of store cattle in the relatively poor and hilly districts of the west. Early maturity is to-day of great importance, and store animals can no longer be permitted to drag out a precarious and half-starved existence. Marketing schemes and subsidies alone are not enough; grassland improvement and the greater production of supplementary crops, although absolutely essential if modern requirements are to be met, alone are not enough; the whole problem in all its aspects must be subjected to regional scrutiny and action in several directions taken concurrently.

Professor Scott Watson has pointed out the advantages to be gained by standardization in respect of milk production, and cites Cornwall as an outstanding example of the use of a single breed of dairy cow (the Guernsey) over a wide area—an area famous for the sustained quality of its milk and cream. In view of the fact that milk is produced under the widest possible range of

STANDARDIZATION OF PRODUCTS

conditions, and in the most varied degrees of quality, it should at least follow that the most favoured districts produce the best milk—the richest milk. This only means that there exists almost unlimited scope for the regionalization of milk production in relation to quality and to the numerous uses to which milk is put.

Professor White deplotes, and with good reason, the contamination of the Welsh mountain breed of sheep that is ever taking place by the partial and haphazard intrusion of other breeds into the rightful domain of the indigenous flocks. This contamination makes standardization of the products—wool and meat—impossible on any wide regional basis, and militates against broadly conceived collecting and marketing for genuine and highly-prized Welsh mountain lamb and mutton.

As with livestock, so with crops. Chiefly as the result of the large number of specialistic seed houses whose businesses extend over the whole country, the farmer has the choice of an excessive number of well advertised varieties in the case of nearly all of his crops. The results of critical experiments, however, tend to show that the number of varieties best suited to any particular region is strictly limited, and in the case of crops which are sold off the farm, wheat, malting barley and oats for grinding, for example, it is advantageous if a uniform product is forthcoming throughout a whole district. The same general arguments apply to the case of seeds mixtures intended for long-duration leys. The type of seeds mixture suitable to a characteristic region is easily determinable. Only the right mixture, consisting of the correct seeds, should be employed; distribution should, therefore, be organized on a regional basis. These are matters that will be considered in detail in a subsequent chapter, but they afford strong additional arguments in favour of an enlightened regionalization of the agricultural industry.

I have endeavoured to show that land improvement and reclamation are twin problems, and that haphazard endeavours in either direction are not likely to lead the nation very far.

The crying need is to re-condition and up-grade the farm and grazing lands of the whole country, but this re-conditioning involves much more than mere attention to the land. Before the land can be used to the best advantage, it is essential to provide adequate and modern housing conditions for man and beast;

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to equip the countryside with modern facilities and amenities. The matters first to be attended to are farm houses, cottages, farm buildings, water supply, electric current, telephone facilities and roads. To begin with, re-conditioning the rural equipment necessary for high farming would be to give immediate employment for altogether more labour than could be absorbed on reclamation and land improvement as such, and this of itself is to-day of the greatest importance. The taking in hand of work of this kind would, moreover, react more favourably on the factories, quarries and mines than would land improvement, and in any event such action is the logical precursor of land improvement, which latter implies higher farming and increased carrying capacity, and therefore demands improved facilities all round. Further than this, to attend to facilities before we make it possible enormously to increase our home production of food would not prematurely place excessive supplies on markets already glutted. Time would be given to arrange and negotiate adjustments, and for the industrial revival further to materialize.

I shall deal with these questions in more detail in my chapter on rural facilities, when I shall have no difficulty in demonstrating the enormous field of endeavour that lies before the nation in respect of each single need that I have narrated above. In the present connection it is only necessary to emphasize the fact that rural re-conditioning, like the re-conditioning of the land, is largely a regional and local problem, but a survey of existing conditions is essential.

A Warning and a Request to the Reader

With the conclusion of this chapter I have stated my case in general terms. To come to details, the logical sequence is to deal first with land improvement and reclamation. The nature and extent of the rural facilities that should be provided must largely be determined by the scale of productiveness to which the land in different regions can be brought—and therefore treatment of this subject must follow after land improvement. The human aspects of my argument—land-mindedness and urban recreation—will then be dealt with more fully.

The discussion of technical details will be unavoidable if I am

WARNING AND A REQUEST TO THE READER

to do justice to a number of these questions, and particularly to land improvement. It is impossible, moreover, completely to segregate technical details from other aspects of the general question: such details cannot therefore be relegated to appendices without rendering difficult or impossible both coherence and cogency in the treatment of the various matters to be discussed. I should like to think, moreover, that technical details connected with the land would be of as much interest to the townsman as to the countryman, while to read about the land, the sorry plight of the land and of the farmer, would possibly be to bring the townsman into closer sympathy with the country. I would remind the reader that if there is force in my arguments and justice in my proposals, both the force and the justice lie in the detailed evidence that I shall have to bring forward and in the technique that I shall describe. It is my hope therefore that the reader will bear with me through my technical passages and chapters, and to encourage him so to do I have avoided the use of technical terms as far as possible.

CHAPTER IV

Resources: Vegetation

Resources: vegetation, land and technique. Rapid changes in technique; point of view. Vegetation an index of character of land. Influence of man and the grazing animal. Woodlands, plantations, semi-natural oak and beech woods, scrub, thorn and bracken. Grassland and rough grazings the dominant vegetation of Britain. Rough grazings dominated by heather, bracken, cotton grass or Dyer's green weed. Rough grazings dominated by a grass species: Nardus or mat grass pastures, Molinia or blue moor grass pastures, fescue pastures. Permanent grass; Agrostis pastures, rye-grass pastures. Reclamation versus re-conditioning. Atmospheric pollution.

The scope that exists for land improvement and reclamation is a function of the amount and type of land available, the nature of the vegetation, and the technique that can be brought to bear on the different classes of land and on the different types of vegetation at any given time.

We have, therefore, to consider the nation's resources in land, vegetation and technique. All three are variables. In the matter of land, to a marked degree and to an ever-increasing extent the modern State makes urgent calls over and above food production upon its land area. The vegetation of a densely populated and man-ridden country is influenced far more by the activities of man himself and of his domestic animals than it is by soil and climate. As a consequence of this the vegetation of this island is held in a plastic and ever-changing condition, it is hardly anywhere allowed to attain to, or remain in, a virginal and climax state of naturalness. Technique changes with bewildering rapidity. It changes with the march of knowledge, with increased facilities, and perhaps chiefly because of shifts in points of view. The last word is always with technique, for always what was once unthought of, once considered out of the question,

owing to improvements in technique, becomes in due season possible, and finally easy of attainment. Technique is, therefore, the key that opens the door to advance in all directions. Before discussing technique we must, however, explore the resources available in land and vegetation—ascertain in short the avenues along which it is open for us to advance.

We can only properly consider the land available for improvement and reclamation if we take vegetation into account, for it is the type of vegetation, more than anything else, which to informed eyes affords the measure of the improvements that are feasible.

The grazing animal has a profound influence on vegetation, and under the climatic conditions of these islands it literally makes for itself its own pastures. If it were not for our cattle and sheep, and the natural destructiveness of man, practically the whole of this country would be in woodland. The woodland areas of Great Britain in existence to-day are either semi-natural or plantations; the latter are entirely artificial and consist largely of exotic coniferous trees. Nature has been interfered with, chiefly by the practice of using woodland areas as coppice with standards, a practice which was maintained for a great many years in this country. The semi-natural woodlands have still much in common with their native prototypes. The nearest approach to the truly natural are the beech woods of the Chilterns, the Cotswolds, the North and South Downs, and elsewhere; while the oak woods (*Quercus pedunculata*) of the clays and loams, for example, are still a feature of the Wealden area; the oak woods (*Quercus sessiliflora*) met with on the lower slopes of the Pennines and in Wales afford further examples—at higher elevations (about 800 ft.) these oaks are of short stature and often but little taller than shrubs. Considerable acreages of semi-natural woodland, often of a very mixed character, and of scrub occur throughout the country, especially in association with sporting estates and sporting districts. Much of this land is of an ambiguous character and may be to a large extent bracken-clad, and is as likely to be classed with rough and hill grazings as with woodland. There is also an appreciable acreage of felled woodland and felled plantation which has not been replanted. Much of this woodland and quasi-woodland occupies land of high

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potential value, while scrub, thorn and bracken—all fore-runners of woodland proper on under-grazed and neglected lands—are rapidly extending their borders in all parts of the country. Scrub lands and lands in general of the type we are considering are relatively expensive to reclaim, as clearing is necessary, and there is always the question of their value as cover for game or for foxes and as contributors to the beauty of the countryside. Certain it is, however, that the longer such areas are left in a semi-wild condition, the more expensive does it become either to replant them or to turn them to agricultural usefulness.

Grassland is now the dominant characteristic of our vegetation, for, including rough and hill grazings, it occupies an overwhelming proportion of the land surface of the whole country.¹ It is this huge area, as I have said, that lies ready to hand for drastic improvement and more intensive utilization, and it is therefore the types of vegetation contributing to pastures, meadows and rough grazings that we must consider in some little detail.

We will classify all these grazings and meadow lands on a two-fold basis; firstly, according as grass or some other type of plant contributes predominantly to the vegetation, and secondly, according to the precise grass which makes the greatest contribution to the herbage. A further valuable aid to classification is the presence or absence of leguminous plants, and, if present, the degree of their abundance. On this basis we can arrange the characteristic vegetational units on a descending or an ascending scale of productivity or usefulness.

In so far as the ordinary permanent grasslands are concerned, grass is almost invariably the predominant partner in the vegetation. It is not so, however, in the case of areas—very considerable in the aggregate—overrun with rushes,² or in the case of the derelict grasslands on the intractable clays dominated by Dyer's green weed.³ The former types of grassland, as I shall show in a subsequent chapter, can be vastly improved with relative ease; the latter types present an altogether more difficult problem.

¹The precise acreage under the different types of vegetation will be considered in the following chapters.

²*Juncus* spp.

³*Genista tinctoria*.

WOODLANDS, PLANTATIONS, SCRUB AND BRACKEN

When we come to rough and hill grazings we have several well-marked types of vegetation dominated by species other than grass. There is firstly the ever-increasing area under bracken.¹ The degree of density of the canopy formed by bracken varies enormously, and the amount of grass associated with bracken is in inverse proportion to the intensity of the shading. Bracken may be associated with white clover as well as with grasses, and often occurs on deep soils of high potential value. The immense area under bracken stands as a witness to the nation's negligence, which even the least observant can hardly overlook. Each characteristic zone needs to be considered on its merits, and in the light of the possibilities of afforestation, grassland improvement, or other intensified usages.

Heather,² like bracken, is invariably, if only to a slight extent, associated with grass, but is seldom accompanied by clover. Speaking generally, it occupies poorer land than bracken, and occurs in great quantities at higher elevations than those at which the fern prospers. Heather, when properly looked after, has a very real economic value both as grouse moor and for sheep, but even in the hills it covers an excessive acreage. Heather also contributes largely to isolated areas of rough ground at relatively low elevations—too small for grouse moor, and but little used for sheep, and, therefore, ill managed and completely poverty stricken.

For the rest, non-grassy vegetation occurs for the most part on moorland bogs where cotton grass³ or deer grass⁴ may predominate, to the almost complete exclusion of grass, and in the absence of legumes. Such areas are by no manner of means unimprovable, but extensive drainage operations are usually necessary.

This brings us to grass proper, and, even in the case of the rough and hill grazings considered as a whole, a larger acreage is under grass-dominated vegetation than under the types mentioned above. It is well once more to insist that the points about grass-dominated vegetation are, that every single type—except the very best—can be improved and easily improved, and that the best and a great deal more besides can be turned to arable

¹*Pteridium aquilinum.*

³*Eriophorum* spp.

²*Calluna vulgaris.*

⁴*Scirpus cespitosus.*

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account easily, and with great advantage to the nation. Improvement will have been achieved if any particular type is converted into the type next better than itself in the scale of usefulness—this is a platitudinous statement, the truth of which is however very generally overlooked. In nearly all cases improvement can be carried altogether further, it is only a case of knowledge, time and expenditure. I will now proceed to make a broad classification of grassland types in an ascending scale of usefulness, which amounts also in a general way to an ascending scale of the demands on fertility made by the various types as such.

*White Grass*¹ or *Mat Grass Pastures*. The grey and ghost-like appearance of these pastures proclaims their poverty and gives a dreary character to enormous areas of mountain and hill land. The white grass is tough and unpalatable; it receives scant attention from sheep, and then only early in the summer; it develops into a coarse mat which disintegrates but slowly, and this creates conditions entirely unfavourable for grasses of a higher value. The white grass pastures occur on acid and peaty soils rather than on raw peat. On the less steep hillsides and on flatter ground, they shade off into blue grass pasture, heather, moor and other types of vegetation more definitely associated with peat of various depths. Mat grass pastures are also met with on lowland heaths, but on such habitats seldom in large contiguous masses. Normally the white grass pastures of the uplands are characterized by a restricted flora, legumes are usually totally absent, sheep's fescue² and bent³ are present in varying and often in only small amounts. On some situations the heath rush⁴ is abundant, and this plant gives a certain value to such areas during the winter, since it is winter-green and eagerly sought after by sheep. Bilberry⁵—in mass of no benefit to sheep—sometimes assumes a position of co-dominance on white grass pastures without in any way increasing their value. A very large proportion of the white grass pastures stand at elevations above the 1,500 ft. contour, and are then out of the range of serviceable afforestation. From the grazing point of view these pastures can be vastly improved even at the highest elevations, and drainage operations are not necessary.

¹*Nardus stricta*.

²*Festuca ovina*.

³*Agrostis canina* and *Agrostis tenuis*.

⁴*Juncus squarrosus*.

⁵*Vaccinium Myrtillus*.

'MOLINIA' OR BLUE MOOR GRASS PASTURES

Molinia, *Blue Grass* or *Flying Bent Pastures*. These are in marked contrast to the white grass pastures, for in June and July they give the appearance of great luxuriance. The *Molinia* grows in massive tufts, and produces a wealth of blue-green leafage. Only cattle can keep pace with the rapidity of early summer growth—sheep soon neglect the maturing leafage—and the amount of valuable fodder that goes to waste every year on the extensive areas of blue grass pasture is prodigious. These pastures cover relatively shallow peat in which the drainage is not wholly impeded, and occupy the more gently undulating ground in hilly districts. Mat grass, sheep's fescue and *Agrostis* are always associated with the blue grass pastures to some slight extent; in the uplands legumes are normally completely absent. Blue grass in the lowlands colonizes poor, wet lying pastures which are not well grazed and not completely water-logged, and, like rushes and bracken, has enormously extended its boundaries in the last sixty years.

In the uplands, the blue grass pastures, in proportion as drainage becomes more impeded, merge into typical moorland types of vegetation, with deer grass, or cotton grass becoming dominant. Typical blue grass pastures, which occupy land of a much higher potential productivity than the mat grass pastures, can be improved out of recognition without the necessity of extensive drainage—these pastures occur in great contiguous masses right up to the 1,800 ft. contour.

The Fescue¹ Pastures. The fescue pastures are varied in the extreme, and in one form or another occur on a wide range of habitats.

There are four main types of fescue pasture: (a) those which cover the steeper hillsides and shallower soils in mountain and hilly districts; (b) the typical Down pastures; (c) pastures occurring on lowland sandy heaths; and (d) the swards of maritime links and sand dunes. All fescue pastures are associated with more or less *Agrostis*, but the fescue is always dominant. Legumes (birdsfoot trefoil,² or wild white clover,³ for instance) are generally, if only sparingly, present; and the flora is more varied

¹In the main *Festuca ovina*, but to some types of fescue pasture *F. rubra* et var. contribute in considerable amount.

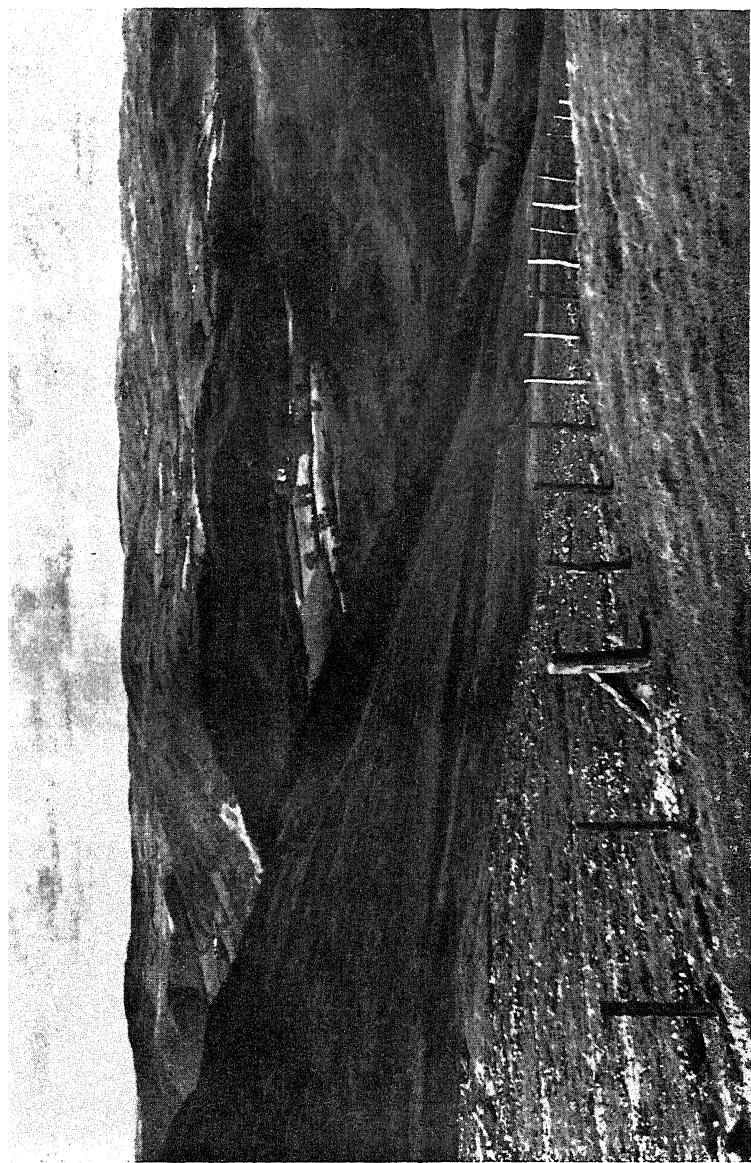
²*Lotus corniculatus*.

³*Trifolium repens*.

than in the case of the white grass or blue grass pastures. The fescue pastures are proper to shallow and relatively dry soils; they therefore afford healthy if but scant grazing. The forester, the grassland improver and bracken are all competitors for the heath and lower lying of the upland fescue pastures. The fescue pastures of all types, moreover, have been made to contribute in generous measure to the recreations of the nation—golf courses, gallops and race courses, for example. The areas under fescue pasture in general are of decidedly higher potential value than those under white grass, but on the balance I should not be surprised if further experimentation were to show that much of the land under *Molinia* could be brought to a higher state of usefulness than that under fescue.

The natural and unimproved fescue pastures are of greater value than the unimproved blue grass pastures only because they are not devoid of legumes, are drier, and afford a very much longer effective grazing season. The length of the effective grazing season is perhaps the most important of all the properties by which the value of grassland is to be judged. The white grass pastures, the blue grass pastures and the fescue pastures are the three great classes of grassland, which, in this country, are semi-natural in character, and which are the least interfered with by man. They are all pasture types associated with extensive methods of grazing. They are to a large extent an outcome of under-grazing, and therein lies a moral indeed!

The downs present their own special problems. The summer grazing is exceedingly healthy, and the stocking capacity is much greater than would be expected from the amount of herbage produced. A striking feature of the down sward is the high contribution and floristic range of the miscellaneous herbs. The ration is, therefore, a varied one and highly mineral-efficient. The downs for generations have been depleted of fertility by sheep running on the unenclosed uplands during the day and being folded on the lower arable land at night. The first necessity is to fence and provide water; this makes it possible to regulate the grazing and to consume the herbage on the spot. Cattle receiving supplementary feed supply the all-important organic residues to the herbage, and by their hoof cultivation further benefit the sward. In the past the plough



Agrostis-Fescue country in Central Wales

‘AGROSTIS’ PASTURES ; RYE-GRASS PASTURES

has fluctuated up and down the hills, and some of the poorest grazings are those that have tumbled back to grass. The acreage of virgin downland that has never been under the plough—an appreciable proportion of which is nothing but rabbit warren—is, however, fairly considerable.

The Agrostis (Bent) Pastures. The fescue and the *Agrostis* pastures can merge almost indistinguishably into each other, but yet they remain clear-cut types. *Agrostis* is the dominant partner in the typical *Agrostis* pastures, and wild white clover is much more definitely an associate of the *Agrostis* than of the fescue pastures. Under heavy grazing, and near to the homesteads, and at the lower elevations, any of the fescue pastures will be convertible into *Agrostis* pastures. The *Agrostis* pastures, helped by man and his grazing animal, are always encroaching on the fescue pastures, and in addition they have their own well-defined range of habitats—the poorer of the permanent pastures. *Agrostis* has to no small degree the merits of a good grass—it can withstand heavy grazing, it can mingle well with wild white clover, and it affords a comparatively long grazing season. In all these respects it is superior to white grass, blue grass and sheep’s fescue.

Thus we find *Agrostis* assuming dominance when conditions are intensified to a pitch adverse to the more ‘natural’ grasses, but not more favourable to grasses still higher in the scale of excellence than to *Agrostis* itself. To a marked degree *Nardus*, *Molinia* and sheep’s fescue are man-shy, while *Agrostis* is the forerunner of the great vanguard of species which follow man—Yorkshire fog, and the ‘better grasses’, such as crested dogstail, meadow fescue, cocksfoot, and rough-stalked meadow grass; and finally perennial rye-grass and wild white clover, which latter species are the ultimate reward for the intensive and well-planned management of grassland: the ultimate reward too of the land improver.

The *Agrostis* pastures are highly plastic and most improvable. Almost every one is a potential rye-grass pasture—yet, as I shall show, by far the largest proportion of the permanent grasslands of this country are but *Agrostis* pastures. As the *Agrostis* pastures approach the standard of rye-grass pastures, some of the ‘better grasses’ will make an appearance, and rye-grass

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itself may contribute in small amount to the sward. On some—the worst—*Agrostis* is completely dominant, and the flora is very restricted; on others dominance may be shared with Yorkshire fog or crested dogstail, or even with wild white clover, and the flora may be extensive. On the heavier and more water-logged soils *Agrostis stolonifera* agg. may be dominant, but, taking our permanent grasslands as a whole, *Agrostis tenuis* is probably the most abundant species.

The *Agrostis* pastures present a wide field for research: they hold the key position to a complete and proper understanding of all the varied grassland problems, standing as they do half-way between the 'natural' and the well and truly man-controlled swards.

I must remind myself I am not writing a treatise on agriculture or on grassland, and in relation to my present term of reference it must suffice to say that the *Agrostis* pastures—sensitive as they are to soil and climate, particularly relative to the nature of the non-gramineous and miscellaneous flora—are good, (within their grade) bad or indifferent, and conform to particular sub-types chiefly in response to the precise management (hay or pasture, and methods of grazing and manuring) to which they are subjected.

The Rye-grass Pastures. If we consider the grasslands of the temperate zones of the world as a whole, the best are those where dominance is shared between perennial rye-grass and wild white clover.¹ Once achieve pastures of this standard, and they can be modified at will to suit any special need—by the partial or complete replacement of the rye-grass by cocksfoot or timothy, or in any other direction desired. While, unless the soil is excessively heavy, too ill-drained or extremely light, conversion to arable land and the production of good crops should present but little difficulty. The best rye-grass pastures may contribute as much as, or even more than, 60 per cent. of perennial rye-grass to the eatables offering to stock. Pastures containing more than about 25 per cent. of perennial rye-grass should be classed with the rye-grass pastures. The rye-grass and

¹Recent experiments conducted at the Welsh Plant Breeding Station, Aberystwyth, on the basis of live weight increase are decisively evidential in this connection.

RECLAMATION VERSUS RE-CONDITIONING

Agrostis pastures, like the *Agrostis* and fescue pastures, merge gradually into each other—and the rye-grass pastures, like the *Agrostis* pastures, can be divided into numerous sub-classes; and very largely on the basis of the amount and kind of the miscellaneous herbs, which are peculiarly sensitive alike to soil, climate and management.

The essentially grassy types of grazings differ from those dominated by heather, bracken, rushes and other coarse plants in that they can, if so desired, be gradually improved without the necessity of first destroying a totally unwanted and altogether extraneous vegetation. On a scale of potential usefulness much of the land under bracken and under rushes is of a value quite as high as the *Agrostis* pastures. Some of the land under heather has no higher value than that under white grass, but much of it has a potential value at least as great as that occupied by the *Molinia* pastures. The areas of lowest potential value are those dominated on the one hand by Dyer's green weed, and on the other by *Nardus*. Even these, however, can be improved and scaled up to much greater usefulness, and chiefly because wild white clover can be made to flourish almost everywhere in Britain—but of this when we come to technique.

Before we study such statistics as are available, and refer to agricultural atlases and other maps of the country, we must make certain important distinctions relative to reclamation and re-conditioning.

Reclamation properly implies the winning or breaking-in of new land for cultivation. Re-conditioning is more an affair of improving land, whether grass or arable, already serving some agricultural purpose in order to bring it into a higher scale of usefulness.

Rough and hill grazings and poor permanent grasslands can either be re-conditioned as grassland, or 'reclaimed' for the purpose of producing crops, forest or orchard. In regard, however, to certain classes of land and types of vegetation, whether we set out to re-condition or to reclaim, it is necessary, in the first instance, to do more than merely destroy or modify the existing vegetation. The first act in reclamation as generally understood is frequently rather for the engineer than for the agronomist. In this country there still remain appreciable areas of marsh

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and few much of which could only be partially improved without extensive draining and pumping operations. In this book I am, however, primarily concerned with such reclamation and re-conditioning as is possible without the intervention of the engineer and costly works—though areas demanding such intervention will be particularized and briefly discussed.

The essential points to realize are, firstly, the magnitude of the area that awaits improvement merely by direct attack on the existing vegetation. Secondly, and this is often overlooked, the fact that a very large proportion of the land that could be completely reclaimed and rejuvenated, with the help of extensive drainage operations or other works, can, without the necessity of such enterprise, be improved to a really important extent by a shrewd and informed attack on the existing vegetation. Thirdly, it follows that when substantial improvements can be effected without preliminary engineering feats the capital outlay is greatly reduced, while such initial expenditure as is called for can usually be redeemed comparatively quickly, indeed some of the methods of improvement to be discussed should pay for themselves within about three years—of this in a later chapter.

Apart from the non-crop-producing uses to which land necessarily has to be put, some classes of poor land and of semi-natural vegetation, as I have said, are suitable alike for afforestation and various forms of improvement for the benefit of stock, while others would serve also the needs of the orchardist. Thus, unless all possibilities are considered, there is considerable risk of areas of land being taken in hand and yet not used to the best advantage—an even graver risk, however, is that of upsetting the balance of country devoted primarily to the production of a particular product. The uses to which the rough and hill grazings, and the sandy heaths, can be diverted are good examples of these dangers. In the case of the generality of the heaths, since they occur to a large extent in suburban and residential districts, and are very much the playground of privately-owned dogs, afforestation is more to the point than the establishment of sward. Much of this heathland could undoubtedly be turned into tolerably good sheep grazing—but the dogs would render utilization on these lines impracticable. With increased knowledge relative to the establishment and maintenance of orchards,

the orchardist and the forester may well come into conflict on the better areas of heathland; the poultry farmer too, aided by grass production, may become a further competitor. In general, however, it is the areas in scrub or woodland, or that have been planted, that represent the better portions of these heaths. The definitely heathy areas to a large extent have been cut for turf in the days of iron smelting, and by that much robbed of fertility. If we take very long views and think only of fertility, to afforest those parts of the heaths not required for urban amenity is perhaps, therefore, on all counts the soundest policy.

Vegetation is not only influenced by the land upon which it grows and by the climate, it is also influenced by the atmosphere—land utilization, like the health of man himself, is, therefore, affected to a marked degree by the atmosphere. The atmosphere over a comparatively wide area in Great Britain, outside of the towns and industrial areas, is polluted—definitely and badly polluted.

This question of atmospheric pollution sets forester and agronomist alike difficult, and perhaps in the case of afforestation, insuperable problems to solve, and it affects regions where unemployment is high, and where idle land lies ready for development. This is not only a problem for urban areas, it is also to a real extent a country problem. I do not believe there is a single issue upon which public money could be spent on a generous scale with greater national advantage than in seeking the means and in enforcing action that would once and for ever ensure that every human being, animal and plant inhabiting this island breathed only an uncontaminated atmosphere. To ponder over this problem is to become increasingly appalled at its magnitude, but we must consider not only what it would cost to rectify matters, but what the present state of affairs means in annual expenditure. It has been stated that fog in London alone costs £1,300,000 a year, while Manchester pays £1,000,000 per annum for its smoke.

I have alluded to all these matters to show that land improvement and reclamation are affected by numerous factors and circumstances over which the agronomist has no control. All the various circumstances must, however, be taken into account before we can form a just estimate of the potentialities of the land surface of this country for enhanced production of timber, crops and livestock.

CHAPTER V

Resources: Land

Classification of land; woodlands, arable, permanent grass, rough grazings. Comparisons of statistics. Residual area; buildings, railroads, mine dumps. Loss of agricultural land. Urbanization. Development of towns; acceleration of demand for land for housing and amenities. Acreage devoted to railways and roads. Increase of motor traffic; wider roads and by-passes. Aerodromes; landing grounds; increase of flying facilities. Recreation; golf courses; playing fields, increases in acreage. Allotments, race courses and gallops. National Trust, acquisition of land. Importance of choice of land for non-agricultural purposes.

This is perhaps the pivotal chapter of my book and I regret to say it is by far the most unsatisfactory. I spent over a month in a study of the available evidence as to the present utilization of the land surface of the country. As a result of trying to make the best of data, none of which is beyond criticism, I found myself writing, at great length and in considerable detail, something more suited to publication in a scientific journal than to the purpose of my book. I shall hope later to devote a further period of months to my researches and in due course to publish the results supported by all the arguments and reservations that are necessary in dealing with evidence of so diffuse and scattered a character. I can here do no more than present my results for what they may be worth, and allude very briefly to the difficulties which are to be encountered in this field of study. My chief aim has been to ascertain the acreage in the country devoted to non-agricultural as well as to agricultural uses, and to particularize as to the numerous claims that are made on the land surface of the country. In the Table on page 45 I have set out the evidence obtained from *Agricultural Statistics* for 1933. This

STATISTICAL STATEMENT FOR 1933

	ENGLAND		WALES		SCOTLAND		GREAT BRITAIN	
	Acreage	Per cent. of land surface	Acreage	Per cent. of land surface	Acreage	Per cent. of land surface	Acreage	Per cent. of land surface
Total area, excluding water	32,033,810	—	5,098,878	—	19,069,007	—	56,201,695	—
Permanent grass	13,706,657	42.8	2,132,919	41.8	1,576,054	8.3	17,415,630	31.0
Rough grazings ¹	3,632,246	11.3	1,725,051	33.8	12,749,313	66.8	18,106,610	32.1
Arable ² -	8,477,091	26.5	609,233	11.9	3,037,243	15.9	12,123,567	21.6
Orchards and small fruit ³ -	274,509	0.9	5,673	0.1	8,920	0.1	289,102	0.5
Woodland ⁴ -	1,630,987	5.1	253,461	5.0	1,074,224	5.6	2,958,672	5.3
Residual ⁵ -	4,312,320	13.4	372,541	7.4	623,253	3.3	5,308,114	9.5

¹Including for Scotland, and therefore for Great Britain also, the full acreage under deer forests, both the forests carrying sheep and cattle with the deer, and those carrying deer only.

²Including market garden crops and temporary leys.

³A certain proportion of the acreage under orchards also carries small fruit. This has not been taken into account; the figures represent the areas devoted to one or the other, or to both types of fruit.

⁴Based on the 'Census of Woodlands' for 1924, and includes woodlands of all types as well as areas felled during the war and in recent years.

⁵Including for England and Wales together about 384,000 acres of more or less no-man's land, *i.e.*, swamps and scrub land (94,000 acres); derelict land formerly used for agriculture but more or less permanently abandoned (37,000 acres); park land, common, heath, moor and rough land not used for grazing (240,000 acres); prospective building land in rural areas not actually in course of development (13,000 acres).

indicates with a tolerable measure of accuracy¹ the acreage devoted to the main types of farming activity and to woodlands—with these aspects of land utilization I shall deal explicitly in subsequent chapters. What I have called the residual area as far as the agricultural statistics are involved is simply the acreage that is not the responsibility of those who collect such statistics. Broadly speaking then the residual area is that devoted to all the needs of a modern State other than food and timber, and it is the residual area which is my present concern.

The expansion of the residual area is always at the expense of the agricultural area²—it is chiefly because statistics are only regularly collected relative to the latter that most of our difficulties arise. The great majority of the non-agricultural calls on land fall on the cultivated land and not on the rough and hill grazings. Unfortunately the rough and hill grazings were only properly categorized in 1921 and subsequently—and even now the acreage in the agricultural statistics cannot be regarded as of the same degree of comparative accuracy from year to year as those for the cultivated land. Any diminution in the acreage recorded as cultivated land will be due not only to urbanization but also to land going out of cultivation—in effect to permanent grass not only reverting to rough grazings but also being scheduled as such. It follows therefore that unless the figures for rough grazings are accurate the residual acreage cannot be assessed with accuracy either. I have taken full account of this, and of innumerable other difficulties and uncertainties, and have adjusted and weighted my various calculations in a manner which I hope has been both just and intelligent in order to obtain at least a tentative statement of the case.

Before coming to the crucial point which I am anxious to decide—namely, how many years must elapse before there is no agricultural land left in Great Britain, it will assist to clarify the position if I allude to a few important considerations connected with the residual area.

¹The agricultural statistics are obtained from returns, and in their collection and presentation are the outcome of the endeavours of a large number of people, consequently they are at best approximations only.

²In this chapter, where I speak of the 'agricultural area', I mean always the acreage devoted to woodlands as well as to agriculture.

LOSS OF AGRICULTURAL LAND

Land that has once been withdrawn from agricultural use, if later abandoned, seldom returns to the farmer, and if eventually it does so it will only be after a long lapse of time. It was estimated in 1925 that there were in England and Wales at that date 37,000 acres of permanently abandoned land most of which had formerly been used for agriculture.¹ This is a fact seriously to be reckoned with in connection with mass migration from one part of the country to another. To-day the movement is from north to south. Perhaps fifty years hence, for reasons which at present we cannot possibly prognosticate, there will be a rush back to the north again—or it may be to the west. All the time and every day land is being ruthlessly taken from the farmer.

This is by no means the whole story; no matter for what use land is requisitioned there will always be waste—more land will be taken than is absolutely necessary for a particular purpose. This is inevitable, owing partly to the configuration of the land, partly to exigencies of ownership and to innumerable other causes. Not only is there definite waste—there is also an immense amount of upsetting of the balance of farm lands. The best fields on a farm perhaps taken for building; rail and road bisecting fine workable fields and making thousands of fields unbalanced in size and awkward in shape. Estates are purchased in a haphazard way for 'development' and the amount of 'builders' waste' in the country must reach a formidable acreage. Apart from the waste in connection with actual building, there is also land that has been removed from agriculture for prospective building but which awaits development. In the rural areas of England and Wales it was estimated that there were 13,000 such acres in 1925. It is important to have emphasized this aspect of the commandeering—for such it amounts to—of the farm lands of the country for other purposes and without any thought being given to the agricultural consequences. If it were possible to make a survey of the whole position since say the advent of the railway, and to translate the changes that have taken place in terms of farm produce, I should not be surprised if the loss in such produce added something in the nature of

¹At the time of writing *The Agricultural output for England-Wales, 1931-1932* had not appeared, consequently I have only been able to consult the earlier volume issued for 1925.

RESOURCES : LAND

15 per cent. to that directly due to the withdrawal of the acres diverted from agriculture to other purposes.

In order to simplify matters as far as possible I shall confine attention to England and Wales.¹ After making a large number of calculations and allowances, I have estimated the true residual area for 1921 and 1931 respectively—as under:

1921	-	-	4,372,332 acres.
1931	-	-	4,684,861 „

On this showing the residual area has gained 312,529 acres during the ten-year period, and has therefore gained at the approximate rate of 31,000 acres per annum. Very considerable fluctuations occur from year to year in the recorded increase in the residual area, thus from 1930 to 1931 it would seem to have grown to the extent of 78,221 acres, while from 1931 to 1932 the gain was 36,598 acres—a figure in keeping with the annual increment over the ten-year period 1921-31. The figures for these two years taken together do, however, suggest that the residual area is gaining on the agricultural area with increasing rapidity.

Before discussing the implication of these figures it will be interesting to approach the matter from the point of view of the change in urban and rural acreages as given in the census returns. The urban acreage of course includes a not inconsiderable proportion of agricultural land, but urban authorities do not seek to extend the sphere of their jurisdiction out of any love of the country, or because they deem themselves more competent than their rural colleagues to safeguard the interests of the farmer. There is a lag between the *de facto* and official urbanization of a particular area—that is all. Land that has caught the eye of the boroughs and municipalities has generally been considerably invaded and very completely unbalanced from the agricultural point of view long before the transfer, and, in any event as far as ruralicity is concerned, is doomed. Thus the trend of increase in the urban acreage does afford a very real comparative measure of the land lost to agriculture in one important direction.

¹The very large acreage in rough grazings and deer forest in Scotland render estimates for Scotland even more unreliable than for England and Wales.

URBANIZATION

The official de-ruralization and urbanization of the country (England-Wales) has proceeded apace since 1901. Below are the figures for the gain in the urban acreage for the three inter-censal periods:

1901-1911	-	-	166,710 acres.
1911-1921	-	-	148,883 „
1921-1931	-	-	340,243 „

The gain has been progressive and has amounted to the formidable figure of 655,836 acres during the thirty years 1901-1931. The rate of gain for the thirty years has been 21,868 acres per annum, while the rate for the most recent period (1921-1931) has been 34,024 acres per annum.

These figures have the merit of being accurate in themselves; and perhaps give a fairly reliable measure of the relative rate at which agricultural land is in fact being lost to the farmer. It is somewhat curious and probably not without significance that the acreage per annum officially urbanized from 1921 to 1931 should be very similar to the figure (31,253 acres) obtained for the same period as to the annual loss of the land under cultivation, woodlands and rough grazings.¹

These estimates, further considered in the light of the various adjustments which I have deemed it necessary to make, indicate that at the present rate of de-ruralization and of encroachment on agricultural land (even if we include the rough grazings and the woodlands with agricultural land) there will be no such land (no land for food or timber production) left in England and Wales 900 years hence. By then the whole country would also have been officially urbanized.

In fact, however, the mushroom growth of civilization bites chiefly into the cultivated lands, and if it were confined solely to such lands the last farm in England and Wales would be closed down in 700 years. It will be noted, however, (see Table on page 45) that England already has 13·4 per cent. of its land surface devoted to non-agricultural uses, while Wales has only

¹The urban districts contain much agricultural land, but on the other hand the 'residual' area has to make room for road extensions and rural buildings as well as for all the industrial and urban claims on the land. Developments in the one direction automatically lead to developments in the other.

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7·4 per cent. This means that the yearly increment of agricultural wastage for England would be greater than for Wales, and that the death knell of rural England would be sounded in appreciably less than 700 years. While if concurrently with the extension of urbanization into the cultivated area permanent grass were permitted to revert to rough grazings at the rate which appears to have been maintained in recent years, there would be little or no agricultural land in the proper meaning of the word in England in 400 years.

Admittedly my figures are but approximations, but I think they must be regarded as bearing the stamp of reality. They are undoubtedly conservative, and I should not be surprised if the wastage is much greater than I have estimated (it was, in fact, twice as great for the single year 1930-31). Even if we allow the widest of latitudes in either direction, there is no possible escape from the fact that if the present rate of wastage continues, and thinking in terms of modern historical time—for what is 1000 years! and 400-600 years hence is but to-morrow—the end of farming in England is already in sight. To me this is a fact in our national (and evolutionary) life that is perhaps of greater moment than any of the innumerable facts that the twentieth century has so far revealed. I will, however, end my chapter on this note, as, unfortunately, I have not yet completed the examination of statistics.

Not only will farming cease in England much sooner than it will in Wales, while Scotland has more land (of a sort) to spare for at least the forester and grazier than even Wales, but in England itself the disappearance of the farmer will apparently be considerably localized at first. For example, the population of Surrey increased by 210,000 between 1921 and 1931, and during this period an acreage equivalent to 9·5 per cent. of the area of the county was diverted from agriculture to residential and other uses. At this rate our own grandchildren will witness the end of farming in Surrey. The wanton selection of some of the richest farm lands for industrial and residential developments is an even greater menace to the countryside and to agriculture than is the rapidity with which changes are taking place in many districts. I know well the area which I may justly describe as Greater Slough, and always I ask myself and at every visit

DEMAND FOR LAND FOR HOUSING

with increasing concern—a concern which now engenders furious anger and fills me with a sense of despair—‘If all this had to be, was it necessary to choose land of quite such a high standard of potential fertility?’ It is indeed a fact that arable as a rule suffers more than grass in housing development; it is generally drier and better drained, while it is ready to hand to convert into gardens.

The only point really worth considering is whether the present rate of wastage of agricultural land will be continued. I think it will, unless drastically checked. I have very little belief in the generally held view that the population once having become stabilized will then proceed to decrease progressively over a long—historically long—period of years. Apart from the reasons in this connection that I have expressed already, I think the unhappiness, and the unnaturalness of small families, and of no families, will work out in such a way as to shatter the optimism of those who see salvation in a greatly reduced population. We owe altogether too much to posterity and to the good sense of posterity to shelter behind this ray of hope and make of it an easy excuse for refusing to face our obligations. A comparatively protracted halt to the increase in population is providential only in so far as it gives the nation a breathing space during which to study the problems of land utilization and to provide against the perpetration of the more glaring errors.

Quite apart from all questions of decreasing or increasing population, it is, however, the changes in the demands made by the urban people that will necessitate further heavy and immediate encroachments on our agricultural lands. Contrast a modern and prosperous city like Birmingham, which has more than doubled its population since 1891, with a typical town in the Durham coalfield. Birmingham has developed on a generous scale, and on its fringes has amply provided itself with gardens and attractive suburbs. Not so towns like Sunderland and Bishop Auckland in the north where there have been no developments on modern and land-demanding lines. Elbow room—whether provided on a week-end basis in the country, by an entirely different planning of the big cities, or by the springing up of new medium-sized towns—is what the urban dweller is going to achieve for himself during the present century. On this

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score—housing—I believe the demands made on agricultural land for many years to come will be accelerated rather than the reverse. It is not, however, only housing as such but to an even greater extent urban amenities that are at issue. I have seen it stated, for example, that in 1927 there were 32,000 acres of land suitable for open spaces within 11 miles of Charing Cross. By 1933 that acreage had been reduced by 8,500 acres. At this rate in 20 years there would be no land available for open spaces within the area under consideration. Very rightly and properly London will compensate itself, and more than compensate itself, for this and other losses at the expense of agricultural land—such is the inevitable course of events.

There remain transport and recreational facilities. It is very important to endeavour to arrive at even an approximate figure as to the acreage in the country devoted to transport facilities; otherwise we cannot form any opinion as to what the demands of the future may entail. Here again I will give only an outline of the results of my enquiries. It would seem probable that Scotland contributes about $12\frac{1}{2}$ per cent. to the railroads of Great Britain and to the land in general occupation for all purposes by the railway companies. Thus weighted, the area devoted to the permanent way and sidings in England and Wales would be approximately 149,000 acres, and that to other uses (including such canals and docks as are owned by the railways) would be of the order of 166,000 acres, making a total of 315,000 acres.

With electrification and an ever-growing desire of the urban worker to get into, or to live in the country, it can hardly be supposed that railway development has attained to anything approaching its limits. The railways, unlike the roads, may not immediately have to double their capacity, and probably to a greater extent than the highways could increase their traffic per acre of road, but that they will make further and considerable demands on agricultural land should, I think, be regarded as certain.

Roads are categorized into three groups; the classified roads (Classes I and II) constitute the main highways, and local authorities receive grants towards the maintenance of these. The unclassified roads include most of the residential streets in

ACREAGE DEVOTED TO RAILWAYS AND ROADS

urban areas as well as the numerous country lanes and tracks which are maintained as public highways. Scotland contributes 14 per cent. to the mileage of public highways in Great Britain. Compared with England, and even with Wales, Scotland is ill served by lanes and the poorer roads.

The mileage of, and approximate acreage (assuming the average width of Class I roads to be 60 ft., that of Class II roads, 50 ft., and that of the unclassified, 16 ft.) devoted to the roads of Great Britain and of England and Wales is set out in the statement hereunder:

CLASSIFICATION	MILES		ACREAGE	
	England and Wales	Great Britain	England and Wales	Great Britain
Class I - -	20,099	26,585	146,176	193,345
Class II - -	12,672	16,644	76,951	101,073
Unclassified -	119,083	134,118	229,506	258,482
Total - -	151,854	177,347	452,633	552,900

The calculation I have adopted shows that the roads of Great Britain occupy a considerably larger acreage than that taken up by all the uses for which the railway companies occupy land. The figures serve to indicate the heavy demands that road development must necessarily make on land. Every year sees a rapid extension of the mileage that is classified, and, therefore, that will be scheduled for widening and improvement. Between 1921 and 1932, 6,629 miles of road were promoted from the unclassified to the classified, and there is no doubt that, apart altogether from the main trunk roads, there is an urgent need for the drastic widening and improvement of a very appreciable proportion of the unclassified roads.

For some time to come, however, it is the main trunk roads that will receive the greater attention, and, to an ever-increasing extent, the dual-carriage way with a central verge is bound to be adopted. The 60-foot roads will be brought up to 80 feet—the 80-foot roads to 100 feet, and to add 20 feet to 100 miles of road absorbs 242 acres. Every town and every village of any

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size will no doubt be by-passed, and cross connections will have to be improved. My figures are bound to be doubled, unless the aeroplane to a very real extent replaces the motor, and where the land is concerned it is wiser to anticipate demands in all directions, and not lightly to assume that developments in several (land-demanding) directions will be incompatible with each other.

Anything in the nature of an industrial boom is sure to be followed immediately by an unprecedented increase in motor vehicles, for the wages of the future will be markedly sensitive to prosperity.

Transport in road and rail must already account for nearly one million acres. On my figures for Great Britain 912,000 acres are involved, and no account has been taken of motor works, garages, depôts and filling stations.

Is flying going to ease the demands of transport on land or add to them? As I have implied above, I think it premature to anticipate any alleviation, and the aeroplane for many years to come is likely to make its own and wholly additional demands on our land surface.

At the present time there are 50 R.A.F. aerodromes and 90 licensed civil aerodromes, and in addition to this there are a number of landing grounds and licences for temporary sites in existence. Aerodromes vary considerably in size according to the type of aeroplane for which they have to cater and the character of the immediately surrounding country. The regulations laid down by the Air Ministry suggest that an aerodrome, to provide for the larger types of aeroplane, should give a run in all directions of from 800 to 1,000 yards. For commercial flying the absolute minimum should be 500 yards in any direction, but, generally speaking, 600 yards is required. For small machines in the light aeroplane class a site as small as 400 yards in each direction might be considered suitable.

With the increasing speed of aircraft and developments in the direction of night flying and in bad weather, the demands on space for aerodromes would not seem likely to become less. It is probable that within the next decade the problems of taking off and landing vertically will have been solved, and that the machines in common use long before fifty years have elapsed

AERODROMES ; LANDING GROUNDS

will be of this type. This is likely, however, in the aggregate to make rather a greater than a smaller demand on ground space in connection with flying, for the number of machines in daily use will enormously increase, while ample room will have to be provided to facilitate manœuvring, and to make for increased safety in foggy and misty weather. There will also be the matter of housing and provision for repairs.

That there is a considerable variation in the size of the important aerodromes of the country is shown by the fact that the R.A.F. aerodrome at Abingdon covers in all nearly 400 acres, with approximately 280 acres of effective landing ground. The public airport at Croydon accounts for 273 acres, while that at Heston has about 83 acres of effective landing ground. The Great West Aerodrome extends to 181 acres.

On the basis of these figures it would seem reasonable to suppose that the 140 aerodromes at present in existence would be unlikely, on the average, to account for less than 100 acres each—or 14,000 acres in all.

The R.A.F. has already planned for eleven additional aerodromes, and these are likely to be large. It is quite impossible to foresee to what extent commercial services in the course even of the next twenty years will come to serve centres of relatively small population. Would it be unreasonable to suppose that every centre with a population of say over 3,000¹ will comparatively soon have an authenticated aerodrome? If 100 acres are allocated to each centre, then with the R.A.F. aerodromes as well, over 100,000 acres in England and Wales will be diverted to the needs of this form of transport—and where will it end?

The acreage is large, but because level land is desired, and if cheapness in construction is permitted to dominate the selection of sites, then of necessity the greater proportion of this acreage is likely to be taken from good farm land. I am informed that the cost per acre naturally varies over a very wide margin, but it is cheapest on good, level arable land which frequently only calls for adequate grading, levelling, consolidating and sowing. The estimates I have brought forward are sufficient to show that transport in all its forms makes very heavy demands

¹There are 742 towns in England and Wales with populations of 5,000 and over; 176 towns with populations over 3,000 and less than 5,000.

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on land, and there would seem no reason to suppose that flight, when it assumes the same importance as road and rail, will make any less demands on land than does land travel itself.

I now come to the question of recreational facilities, and here again the matter is conjectural, but we have a certain amount of data to go upon. Probably, however, it is possible to state with greater accuracy, at all events in some instances, what the acreage is likely to be comparatively soon than what it actually is at present.

If we leave out of the question whether the various areas devoted to playing grounds are used to any extent for grazing, and whether they occupy land within or without the 'city walls'—which is of no significance since, as in all cases, it is agricultural land that ultimately provides the space—certain of the acreages can be estimated with moderate accuracy.

In my chapter on urban recreation (Chapter XXI) I shall deal in greater detail with these questions; here I am merely concerned with acreage. I shall produce evidence which indicates that the golf courses in England and Wales at present in existence probably cover not less than 130,000 acres, and in my view (and I give my reasons in the appropriate chapter) the area devoted to golf is likely to be greatly increased—considerably more than doubled.

Open spaces and recreation grounds within the municipal and borough areas of England and Wales would seem to reach a total of about 144,324 acres—this total, however, includes such open spaces, for example, as the Burnham Beeches, which are wholly outside Greater London, and therefore outside the municipalities.

There are no means of estimating the actual acreage under playing fields as such. The National Playing Fields Association, however, advocates the provision of 7 acres of ground per 1,000 head of population, and if this allocation was a reality 279,636 acres would have been requisitioned in England and Wales for the purpose. It follows, therefore, and thinking only in terms of the standards of to-day, that the provision for open spaces and playing fields at present falls far short of what is necessary, and that heavy calls on agricultural land have yet to be made for both purposes. A quite appreciable acreage must be devoted to race courses and gallops, as also to dog racing.

NATIONAL TRUST, ACQUISITION OF LAND

There remains the rural land scheduled as National Monuments and that held by the National Trust (44,000 acres)¹ and other preservation authorities. The aim of the National Trust and kindred bodies is to keep the various lands in their present unspoilt condition and in their present usage. This does not necessarily imply no interference with agriculture—for the demands of agriculture are plastic and as far as the future is concerned completely unknown—thus the potential development of British agriculture cannot be entirely unaffected by the acquisition and administration of land by those whose first concern as landlords is to safeguard aesthetic values as judged by rigid standards.

A large proportion of the recreation grounds will always have a limited agricultural value, but a value that is strictly limited because far-reaching developments are out of the question. One possibility, however, is worth mention, and that is the drying of the grass—a big tonnage in the aggregate—taken from sports grounds, golf courses, race courses and also from aerodromes. This may assume real importance, because in the national interest there can be few matters of greater urgency than the generous provision of recreational facilities out-of-doors—while to decrease the nation's bill for imported feeding stuffs in the opinion of many would be a worthy object.

If I have been able to make estimates for recreation and transport, I have been quite unable to estimate the acreage devoted to towns and villages respectively, or to particularize as to their precise make-up. I have no estimate for cemeteries and churchyards, no estimate for sewage farms, or for quarries and industrial activities in general. It is apparent, however, after making allowance for transport and recreation facilities, and for allotments,² as well as for land that is completely waste (*e.g.*, swamps) that very much the larger proportion of the residual (non-agricultural) land consists of built-up areas, factory sites and dumps, residential amenities (houses and gardens) and all those items concerning which it has been impossible to par-

¹Not quite all of which is rural.

²Allotments have fallen in acreage between 1920 (185,000 acres) and 1930, at which latter date the area was returned as 146,000 acres. Strictly speaking, allotments are not in competition with agriculture for land, for in general they represent intensive food production.

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ticularize. Just the very items which in fact are to-day probably making the heaviest, and almost certainly the least well considered and most wasteful use of agricultural land. These too are the items which will be so greatly influenced by the re-orientation between town and country which is proceeding so rapidly, but which in all probability can hardly be said yet to have started in real earnest.

Our agricultural acres are dwindling rapidly, and dwindle they inevitably must, and unless some decision is made as to the minimum acreage that should at all costs be retained for food production, and appropriate action taken, no more than two hundred years hence may see the farm lands of England reduced to one-half.

To my mind the whole trouble relative to our land surface arises from short views and short-sighted notions as to economics. Justification is relative. If we look forward only twenty or even fifty years a certain action may appear eminently justifiable—while if we look forward 100 or 500 years the same action may amount to nothing short of criminal folly. Where the land is concerned, we are only tenants for life. The immorality of mortgaging posterity is surely the quintessence of immorality and short-sightedness carried to the point almost of madness. The immoral and hand-to-mouth economics of these days the nation can no longer afford and must no longer tolerate. No matter if it costs ten, twenty, thirty times as much to build an aerodrome, a reservoir, a suburb or a city on land of little or no agricultural value as on good land, it is the duty of life tenants to choose wherever possible the poor, even if relatively unsuitable, land, and incidentally, which matters greatly to-day, to employ more labour in the sundry constructional activities. If the choice was with posterity, and the decision lay between a well-arranged England with still a large acreage of farm lands and a considerable sinking fund still to be paid off, or no sinking fund and *no England*, there can be hardly a doubt as to which posterity would choose. I should imagine that the only accurate definition of sound statesmanship is the foreseeing and catering for the needs of posterity, and I should imagine further that it is only in striving after this ideal that both individuals and nations can attain to happiness or to greatness.

LAND FOR NON-AGRICULTURAL PURPOSES

Where land, the most precious of all the nation's material assets, is concerned—since its absolute amount is practically a constant—to plan on anything less than units of a hundred years is inept in conception and can, therefore, only be inept in realization. This is the central theme of my argument, and it is in the fact that the amount of land available for food production is a shrinking acreage that we have the strongest incentive, on the one hand, to undertake works of reclamation and of improvement, and to intensify to the absolute maximum our methods of farming, and on the other, to provide as far as may be possible for the urgent needs of industry and housing on poor land, and upwards rather than outwards.

CHAPTER VI

Resources: Cultivated Land

Changes in sixty years. Wheat and oats. Statistics for 1868, 1901 and 1932. Corn-growing and grazing counties compared. Types of arable farming. Arable-grass rotations. Permanent pasture. Contrasts between counties. Rye-grass and Agrostis pastures. Reversion to Molinia and Nardus. Reversion to bracken and rushes. Arterial drainage. Field drains. Excessive weediness. The condition of dairy pastures. The fattening pastures. Productive capacity of the different types of pasture; meat, and dry matter, chemical composition. Influence of management.

WE have now to deal with the agricultural lands, but before considering the matter from the point of view of their distribution at the present time we must try to trace the changes that have taken place in the last sixty years.¹

Very fortunately agricultural statistics were collected during at least the latter part of the period 1851-1873 which, chiefly on account of wars abroad and the Civil War in the United States of America, was a good time for British farmers.

Although the Corn Laws were repealed in 1846, the agricultural depression did not make itself felt till 1874, and then it continued until about 1894. From the 'nineties up to the war was a period of more or less steady reconstruction—a period during which agricultural science, sponsored at last by the State, caught up with practice. The war period, though responsible for the temporary conversion of over three million acres of grass to crops and much hectic endeavour, led to nothing constructive, and in no wise called a permanent halt to the shrinkage in our arable area. After the war, first the boom and madness, then drift and uncertainty. In the meantime, however, agricultural

¹It would assist the reader in following this and subsequent chapters if he would refer to Plates 14-17 in the *Times Atlas*.

CHANGES IN SIXTY YEARS

science had definitely outstripped practice, and now enquiry and experiment.

By courtesy, in the statistics, permanent pasture is included with arable land, the two together constituting the so-called 'cultivated land' of the country. To my own certain knowledge, however, there are great acreages of permanent pasture that have had no implement of any sort or kind on them for the past thirty years, and many, many acres that have scarcely been trodden by man or beast during the same period. The implied distinction between rough grazings and permanent pastures is that the former have never felt the weight of any implement, while the latter, at least on rare occasions, receive some attention.

During that prosperous time when statistics were first being collected (1866-1873) the arable acreage (temporary grass and crops) of England and Wales (in this chapter, as in the last, I shall confine my attention chiefly to England and Wales) was over 14½ million acres.¹ By 1901 it had dropped to nearly 12½ million acres, and by 1932 it was no more than 9,366,506 acres—a falling off of 36 per cent. in sixty-odd years. The area under permanent grass, on the other hand, increased from 11,377,000 acres in 1871 to 15,399,025 acres in 1901, and in 1932 had reached the highest figure recorded up to that date, namely, 15,839,576 acres—a rise of 39 per cent. in the same period.

A considerable proportion of the older of the temporary leys is tantamount to being permanent grass. In this connection it is interesting to find that 'on the basis of the returns the acreage under temporary grass actually increased by about 69,000 acres between 1872 and 1901. This, if a true statement of the case (it is in fact almost certainly an under-statement) is what would be expected, and is to be explained by the growing tendency in many districts to reduce crop production in each rotation by leaving the leys down for increasingly long periods. By 1932, however, the acreage in leys had fallen short of the figure for 1901 by no less than 852,000 acres. This decrease can only mean that a very large proportion of the older leys had been left to

¹The actual figure given for 1872—the highest return between 1868 and 1874 inclusive—was 14,943,000 acres.

RESOURCES : CULTIVATED LAND

deteriorate to such an extent during the thirty years that in any event over 800,000 acres of them had found their proper place and come to be scheduled with permanent grass. The question that must remain unanswered is: How many more thousand acres should have ceased to have been dignified with the name of arable?

In so far as the arable land proper is concerned, the largest falling off has been in the acreages respectively under wheat, barley and swedes. The area under wheat in the 'seventies reached about $3\frac{1}{2}$ million acres¹ and was considerably in excess of the land under oats. By 1931 wheat had fallen to less than $1\frac{1}{2}$ million acres, thus occupying a smaller area than oats.² Although the reduction in the acreage under wheat has been greatest in Lincolnshire, Norfolk, Suffolk and Essex, these four counties must still be regarded as the wheat-belt of the country.

Oats, which in England and Wales are grown more essentially as food for stock and especially for horses, and of which we normally produce at home about 70 per cent. of our requirements, rose from approximately $1\frac{1}{2}$ million acres in 1872 to just over 2 million acres in 1901. The decade ending 1901 was, however, a period which saw a very large increase in the number of horses employed in connection with urban and industrial developments. By 1932 the oat breadth, despite its connection with stock farming—but largely on account of its special relation to horses—had fallen short of the position it occupied even in 1872 by about 84,000 acres.

When we think of the enormous advances that have been made relative to artificial fertilizers, varieties of crops, mechanical aids to cultivation and the science of crop production, to say nothing of the steady increase in population, this dwindling of our arable acreage during the past sixty years seems incredible. It is credible and a reality, only because the farmer has not been the master of his own destiny. He has been a pawn in the game

¹It has been estimated that during the golden age of English Agriculture (1853-1862) the wheat acreage probably exceeded four million acres.

²The acreage under wheat in England and Wales in 1931 was returned as 1,196,701 acres. In 1932 the figure had risen, however, to 1,287,944 acres, being an increase of 8 per cent., due no doubt to anticipations which were realized later in the passing of the Wheat Act.

of winning markets in the development of our export trade and in the amassing of national wealth, and a slave to world changes of which no man is the master. Look at the matter however we will, and glory as much as we care to in the fact that for many years we were the workshop of the world, there is something extremely ironical in the whole sequence of events. Millions of British capital won in industry devoted to the opening up of millions of new acres in new countries, opened up by British enterprise, British pioneers and British breeds of stock, while our own British acres fall to rack and ruin, our miserably paid agricultural workers are compelled to desert the country, and pioneering on the land at home ceases to be even dreamed of as a means of acquiring grace or a livelihood.

I have cast about with a view to finding a convenient means of showing in as striking a manner as possible the differential influence of these changes as applied to England (including Monmouth). In the statistics for 1868 a table is given comparing the essential differences in the allocation of 'cultivated' land and in livestock, between the grazing and the corn-growing counties of England. Although the returns for 1868 cannot be regarded as of the same standard of accuracy as those respectively for 1901 and 1932, I have re-constructed the 1868 table for both of these latter years, for the differences are sufficiently great and striking not to be seriously influenced in their broad implication by a wide margin of error.

The three tables are here set out. The 'grazing' counties—I, of course, adhere to the 1868 classification throughout—are as follows: Northumberland, Cumberland, Durham, Westmorland, York (North and West Ridings), Lancashire, Cheshire, Derbyshire, Stafford, Leicester, Salop, Worcester, Hereford, Monmouth, Gloucester, Wiltshire, Dorset, Somerset, Devon and Cornwall.

The 'corn-growing' counties are: York (East Riding), Lincoln, Nottingham, Rutland, Huntingdon, Warwick, Northampton (including the Soke of Peterborough), Cambridge (including the Isle of Ely), Norfolk, Suffolk, Bedford, Buckinghamshire, Oxford, Berkshire, Hampshire, Hertfordshire, Essex, Middlesex, Surrey, Kent and Sussex.

RESOURCES : CULTIVATED LAND

<i>Year 1868</i>	<i>Grazing counties</i>	<i>Corn-growing counties</i>
Total acreage returned as under crops, bare fallow and grass - - - - -	12,109,000	10,929,000
Acreage under wheat - - -	1,286,000	2,111,000
	or 10 per cent. of total acreage.	or 19 per cent. of total acreage.
Acreage under permanent pasture - - - - -	6,363,000	3,341,000
	or 52 per cent. of total acreage.	or 30 per cent. of total acreage.
Total number of cattle returned	2,484,000	1,295,000
	or 66 per cent. of total number in England.	or 34 per cent. of total number in England.
Total number of sheep returned	10,638,000	10,292,000
	or 51 per cent. of total number in England.	or 49 per cent. of total number in England.

<i>Year 1901</i>	<i>Grazing counties</i>	<i>Corn-growing counties</i>
Total acreage returned as under crops, bare fallow and grass	13,417,000	11,612,000
Acreage under wheat - - -	459,000	1,098,000
	or 3 per cent. of total acreage.	or 10 per cent. of total acreage.
Acreage under permanent pasture - - - - -	8,676,000	4,570,000
	or 65 per cent. of total acreage.	or 39 per cent. of total acreage.
Total number of cattle returned	3,172,000	1,541,000
	or 67 per cent. of total number in England.	or 33 per cent. of total number in England.
Total number of sheep returned	8,975,000	6,106,000
	or 60 per cent. of total number in England.	or 40 per cent. of total number in England.

<i>Year 1932</i>	<i>Grazing counties</i>	<i>Corn-growing counties</i>
Total acreage returned as under crops, bare fallow and grass	12,311,000	10,792,000
Acreage under wheat - - -	326,000	948,000
	or 3 per cent. of total acreage.	or 9 per cent. of total acreage.

STATISTICS FOR 1868, 1901 AND 1932

<i>Year 1932</i>	<i>Grazing counties</i>	<i>Corn-growing counties</i>
Acreage under permanent pasture - - - - -	8,734,000 or 71 per cent. of total acreage.	5,163,000 or 48 per cent. of total acreage.
Total number of cattle returned	3,671,000 or 66 per cent. of total number in England.	1,887,000 or 34 per cent. of total number in England.
Total number of sheep returned	9,240,000 or 64 per cent. of total number in England.	5,144,000 or 36 per cent. of total number in England.

An examination of the three tables shows that the decrease in the wheat acreage has been most pronounced in the 'grazing' counties, in which counties it has fallen since 1868 by as much as 75 per cent., compared with a fall of 55 per cent. in the 'corn' counties. Wheat in the 'grazing' counties now contributes only 3 per cent. to the cultivated land, whereas in 1868 it contributed as much as 10 per cent.

As a set-off to the wheat position, permanent pasture has made the greatest gains in the 'corn' counties, where it has increased in amount by 55 per cent. since 1868, compared with an increase of 37 per cent. in the 'grazing' counties. The permanent pasture in the 'grazing' counties is, however, still far in excess of that in the 'corn' counties, for to-day it contributes 71 per cent. to the cultivated land in the former counties compared with 48 per cent. in the latter, and compared with 52 per cent. which was its contribution to the 'grazing' counties in 1868. The movement towards permanent grass in the 'corn' counties, it will be noted, although well marked between 1868 and 1901, has been much accelerated between 1901 and 1932. This brings out an important and interesting point, namely, that arable farming in the 'corn' counties would in many cases have fallen off more than it actually has, had it been considered easy under conditions of comparatively low rainfall to put land down to good grass—the plough has, in fact, to a very large extent been kept going as the lesser of two evils. This to a marked degree has been true of counties like the East Riding of Yorkshire, Norfolk and Suffolk. Since 1901, and progressively since about 1911, much

RESOURCES : CULTIVATED LAND

more has been learned as to putting land down to grass under difficult conditions, and this is reflected in the increasing tendency towards grass in the 'corn' counties—a tendency which the Wheat Quota is likely to curtail.

The changes as to cattle have been hardly noticeable as between the relative numbers maintained by the 'grazing' and 'corn' counties; the relative figures—66 per cent. for the 'grazing' counties and 34 per cent. for the 'corn' counties—are indeed precisely the same for 1868 as for 1932. In the meantime, however, the cattle population of England as a whole has increased by 44 per cent. The growing cattle population has been primarily due to a remarkable expansion of the dairy industry, which has greatly extended since the war. Thus for England-Wales the number of dairy cattle increased by as much as 8 per cent. between 1918 and 1928. The steady increase in cattle is due, I am afraid, not so much to a markedly more skilful management of grassland, or to any remarkable developments in arable dairying, or in arable stock farming, as to a more heavy, and certainly a more knowledgeable, use of imported feeding stuffs, combined with an increase in the acreage under grass. In this country dairy farming remains an essentially pastoral industry. This matter of imported feeding stuffs is very liable to be ignored when we flatter ourselves, as we often do, that we produce at home about one-third of the products of grassland which we as a nation consume or utilize, and that we could enormously increase the amount of such products. That we could do so is true enough, and to a greater extent than anybody even yet realizes, but we must be perfectly honest with ourselves about the imported feeding stuffs. Thus, for example, Sir Thomas Middleton has estimated that concentrated feeding stuffs contribute one-fifth to the production of the nation's milk supply, and we import about 62 per cent. of our feeding stuffs.

The position as to sheep is brought into strong relief by the figures in the tables. In 1868 the 'corn' counties were carrying nearly as many sheep as the 'grazing' counties—49 per cent. and 51 per cent. respectively. By 1932 the arable sheep had, however, dropped in numbers to the extent of 50 per cent., while the falling off in the grass sheep was only 13 per cent. Thus, by 1932, 64 per cent. of the sheep population in England was in

TYPES OF ARABLE FARMING

the 'grazing' counties, and only 36 per cent. in the 'corn' counties. By 1901 the change in this direction was already most pronounced, the comparable figures being 60 per cent. and 40 per cent.

With this general review I must now pass to a more detailed consideration of arable and permanent grass respectively.

Arable. Arable farming in this country is of three main types.

(a) The highly concentrated form which is almost independent of stock. This is restricted in area, and is concerned for the most part with crops for direct human consumption such as potatoes, fruit and vegetables. Suitability of soil perhaps counts for almost everything, and arable such districts, no matter what befalls, are always likely to remain. It is evident that the area (per cent. arable to cultivated land) and the concentration (per cent. leys to arable), particularly the latter, have altered very little since the 'seventies in respect of these favoured districts. Thus the Isle of Ely to-day has 79 per cent. under arable, and only 3.4 per cent. of that arable in leys; the Holland division of Lincolnshire has 79 per cent. of its cultivated area arable, with leys no more than 6.5 per cent. of that arable. The fact that Kent has only 7.9 per cent. of all its arable area in leys is evidence of the concentration implied by the growing of hops, fruit and vegetables. Typical, though smaller, areas of arable concentration are the potato districts of Lancashire and Cheshire, and the fruit and market garden districts of Worcestershire.

(b) Where the arable farming is largely based on corn growing (usually in conjunction with the bare fallow), with a ley contribution of not more than 20 per cent. to the area under rotation. This type of farming is associated perhaps more essentially with low rainfall (favourable to harvesting and unfavourable to grass) than with soils of outstanding quality, or of marked suitability for crop production. It is counties of this kind, for example, Norfolk, Suffolk, Essex, Sussex and the East Riding of Yorkshire, and essentially arable counties with heavy soil, like parts of Cambridgeshire and Huntingdon, that have suffered acutely during recent years.

(c) Where the arable farming is incidental to stock farming on an essentially grassland basis. This to-day is true of practically all the Welsh counties and of Northumberland, Westmorland,

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Cumberland, and Devon—counties with over 40 per cent. of their arable land in leys, and it is true, too, of large parts of many other counties, such as, for example, parts of Cheshire, Herefordshire, Worcestershire, Shropshire and Cornwall.

Intermediate between these essentially grass counties and the corn counties of to-day we have those which have been much influenced by the fall in arable, and are not by virtue of soil and climate so well suited to the long ley as are the western and northern counties above mentioned. Hampshire, Wiltshire, Berkshire, Buckinghamshire and Gloucestershire are good examples.

How and where and by virtue of what causes is there a reasonable prospect of extending the arable area? That is the issue immediately before us. Great changes in two opposing directions appear likely. There is, first, mechanization as applied to corn and vegetable production, supported by crop drying; this eventually is almost certain to lead both to an extension and, on the face of it, to a concentration of arable farming. In the second place, however, modern knowledge and the improved strains of grassland plants are making it possible to establish good leys in all manner of unexpected places—in fact almost anywhere; coupled with this is the question of dried grass.

Mechanization has only just begun to make itself seriously felt, and perhaps chiefly as to harvesting. The gyro-tiller is probably the forerunner of surprising developments relative to cultivation, and only the most uncompromising pessimist can refuse to believe that before very long mechanical means will be found making it easy to work even those heavy clays that have so long and so steadily been going out of cultivation. Thus it is my firm conviction that an altogether closer connection between crops and grass will be the next stage in the farming history of this country. The ultra-arable districts are likely to be unaffected, and perhaps the low rainfall arable counties will develop on still more intensive arable lines—with wheat or barley and vegetables united in one rotation almost completely devoid of the ley. The scope for extension of this sort will depend to an overwhelming extent on the facilities that may be developed for the better marketing and distribution of fresh vegetables. The

ARABLE-GRASS ROTATIONS

closer welding of arable with grass will come about in all those counties and districts which have so long wavered between grass and arable—a very much larger area than that which has remained loyal to the plough.

Dried grass may well prove to be one of the decisive factors. The drying of young grass appears to be the one means at the disposal of the British farmer for very largely dispensing with imported concentrated feeding stuffs; it may also prove to be an invaluable aid to increasing generally the amount of fodder available for wintering. Dried grass, like mechanization, is in its infancy; a little cheapening of the processes and a slight rise in the prices of concentrates might easily tip the scales in favour of dried grass—and this quite independently of any special virtues inherent in dried grass as a feeding stuff, virtues regarding which the evidence hitherto obtained is insufficient to allow of their being justly assessed.¹

As to the production side of dried grass I hold very definite views, and they are based on a wide and long experience of grassland. If it does come into its own—and this I think can only be a matter of time—it will be found most economic and most satisfactory over a period of years to obtain the necessary grass from long-duration leys sown down at regular intervals and maintained for that special purpose.² I believe then that mechanization and grass will join forces over a very large acreage in England, and that we shall have a great extension of the plough in the interests of stock and dairy farming. Grass, however, will be the chief crop; arable-grass farming may indeed come to replace an enormous acreage, perhaps three-quarters, of the permanent grass in the country. Long-duration leys, like dried grass itself, are really only in their infancy, and at present, and quite inde-

¹There is not only the question of the carotene content in relation to the quality of milk, but there is the possibility of dried grass being an admirable supplementary feed for grass sheep (and especially ewes) fending for themselves on poor pastures during the winter.

²Any absolutely unified system of management of grassland leads to deterioration. To take large crops of young grass from a farm maintained in permanent grass would necessitate a complicated rotation, and the periodic resting of all the fields from the production of grass for drying. Good leys are more productive and much less weedy than permanent grass. Weeds contain a much lower percentage of dry matter than does grass.

RESOURCES : CULTIVATED LAND

pendently of any question of dried grass, are but little understood and but poorly managed, while the scope they afford for providing winter grazing is nowhere fully appreciated. The idea of grass as a crop capable of being made subservient to all manner of special needs, and demanding tillage and care, as an idea is new. If the drying of grass is developed only on factory lines it may compete, and this to a considerable extent through the medium of lucerne, with cereals and vegetables in the low rainfall arable counties. More likely I think it would establish itself as an industry in what I have described as the wavering counties of somewhat higher rainfall. If, on the other hand, cheap driers make it feasible for the farmer to dry his own grass, then ultimately we should see a great extension of arable-grass farming in the essentially grass and high rainfall counties of Wales, the north and the west.

The ley has also its part to play in connection with cereal growing. Mr. Roland Dudley, a pioneer in mechanization relative to wheat production, has expressed the view that the cereal rotation of the future may be grass, cereals, cereals, grass. This would be to use grass (the short ley with clover, of course) as a means of maintaining fertility for the ultimate production of corn. Such a rotation opens up endless possibilities; poultry or even pigs might be used to convert the grass and enhance fertility—while it is always possible to plough down a grass surface under weather conditions when it would be inexpedient to plough stubble. The frequent intervention of the short ley with an abundance of clover (either red clover or white clover) not only enhances fertility and the humus content of the soil but is also an admirable means of maintaining land in a weed-free condition—an aspect of the short ley (if properly established and cared for) which, I think, is not sufficiently appreciated.

Permanent Pasture. A glance at the Table which appears on page 45 will show the overwhelming extent to which our agriculture is based on grass, and the very limited area devoted to anything approaching intensive arable farming. Small wonder then that about 72 per cent. of the estimated value of the produce sold off farms, and of that consumed in farm households, is accountable to livestock products.

If we include rough grazings and leys with permanent grass

CONTRASTS BETWEEN COUNTIES

and arable, we shall find that the contribution of grass, or at least of grazings, to the total agricultural area of the following nine counties, in descending order of grassiness, is in excess of 90 per cent.:

Westmorland and Merioneth	-	97	per cent. approximately
Brecon and Glamorgan	- -	96	" "
Caernarvon and Radnor	- -	94	" "
Northumberland, Montgomery and Monmouth	- - - -	93	" "

Figures such as these serve to emphasize how truly grass-ridden is our farming, for the agricultural area (including rough grazings) of these nine counties totals over 4 million acres. The most interesting counties are Monmouth, Glamorgan and Northumberland, for in each of these the plough was once comparatively active. Indeed large areas of Monmouth are essentially arable land; in 1871, only 59 per cent. of the cultivated land was permanent grass; to-day the permanent grass exceeds 86 per cent.

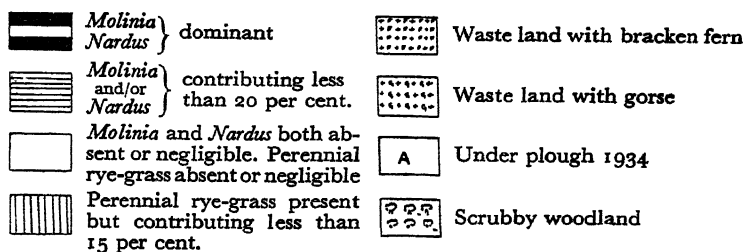
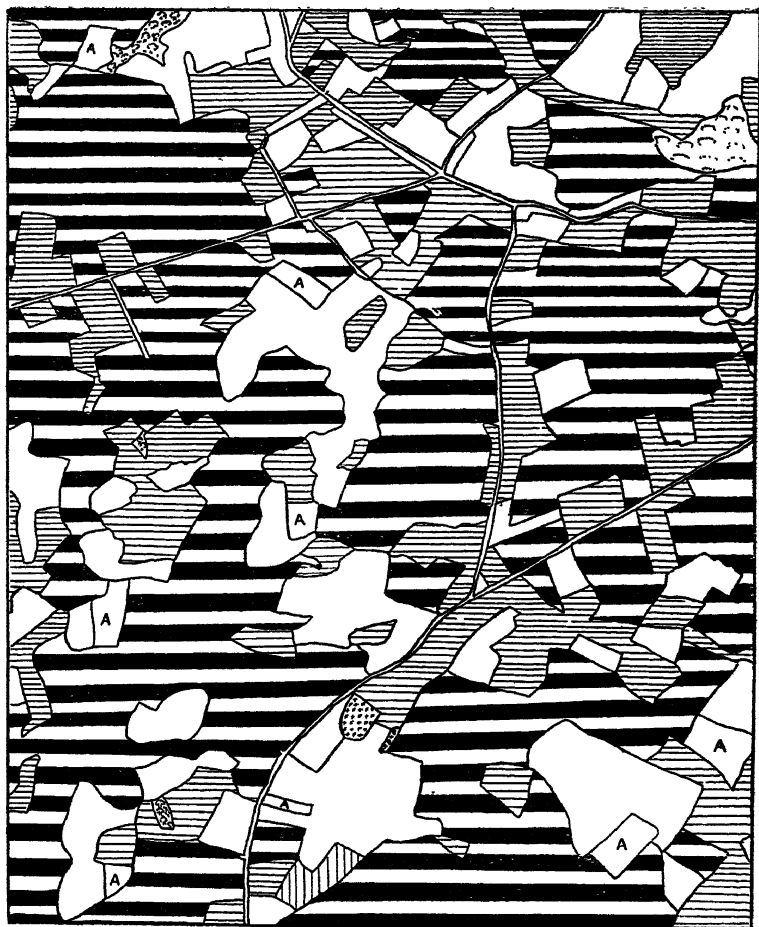
I know of no more striking example than Monmouth, of land—inherently good land—that is producing infinitely less than that of which it is capable. And yet, I suppose, by the usually accepted standards it is a county which would pass muster as reasonably well farmed. As the outcome of a fairly accurate survey covering 121,750 acres, it would appear that no more than 32 per cent. of the leys and permanent grass in Monmouth contain rye-grass in appreciable amount. I am certain, however, that comparatively easily and without great expense, I could convert practically the whole of these grasslands into tolerably good rye-grass pastures. A large proportion of the grassland is good *Agrostis* pasture, and thus is easily improvable, especially if brought under the plough. Monmouth affords typical examples of land brought under the plough during the war, and then left more or less to find its own sward. With the doleful experiences of the ploughing-up campaign to guide us, it will be nothing less than tragic if the Wheat Quota leads to the same final results—inferior grassland. All the indications are that this will be the case in a large number of instances where the Quota has been an incentive to ploughing in the more essentially grass-land counties. Since the Quota applies equally to the wheat

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belt and to the northern and western counties, it would not be easy to so frame the regulations as to ensure that a part at least of the benefit was returned to the land. This might be provided for in some districts, perhaps, in terms of an efficient bare fallow; in others in terms of lime, and in yet others in the form of an adequate seeds mixture.

Glamorgan in some respects stands half-way between Monmouth and Northumberland, for an appreciable proportion of the permanent pastures in Glamorgan have reverted to what is tantamount to rough grazings. In Northumberland over a very considerable acreage it is practically impossible—save for the tell-tale evidences of old lands—to distinguish between permanent pasture and rough grazings.

I am able, thanks to Mr. William Davies, to give some very illuminating details based on a field-to-field survey relative to an area of about 35,000 acres situated in and near the anthracite coal field of South Wales. Ammanford stands towards the east of the block, which is partly in Glamorgan and partly in Carmarthen. The whole block of country lies between the 50 and 1,000 ft. contours, most of it being about 400-600 feet above sea level. The area in question has no doubt fallen into its present state, ironical as it seems, largely because of the rapid growth of the anthracite industry. In this chapter, however, I am only concerned with the existing state of the land; in a subsequent chapter I shall discuss causes. The farms are small—the average size being about 50 acres—and are almost wholly in grass. As much as 35 per cent. of the acreage consists of pastures more or less dominated by *Molinia* and *Nardus*, such fields being but little used and almost worthless. Eighteen per cent. of the area consists of pastures with a considerable amount of *Molinia* and *Nardus*; on such fields rushes are abundant and the chief grasses are *Agrostis*, Yorkshire fog and fine-leaved fescues. These fields are of little real value either for hay or grazing. The better fields in only a negligible number of cases approximate to the rye-grass standard, 36 per cent. of the whole area consisting of rather poor *Agrostis* pastures, and these are the only fields that are being put to any appreciable use. The fences are in a broken-down condition—about 76 per cent. are not stock-proof. In some cases scrub has grown out 10-20 feet each side of the hedges,



Plan representing 1920 acres of farmlands in the neighbourhood of Ammanford. The excessive proportion dominated by *Molinia* and *Nardus* is typical of much of this area

REVERSION TO 'MOLINIA' AND 'NARDUS'

which had been well made and at one time well cared for.

Northumberland is a county of the most astounding contrasts. To enter this expansive and intriguing county from the west and to remain in the unspoilt and truly rural areas is to make it seem incredible that there is such a phenomenon as the industrial north. Northumberland has to its credit some of the finest temporary leys in the whole country, and to its discredit some of the most derelict permanent grass imaginable. In 1871 Northumberland had as much as 48 per cent. of her cultivated land in arable, and grew 41,716 acres of wheat; by 1931 the wheat breadth had dwindled to 3,763 acres and the arable to 23 per cent. of the cultivated land. Of that arable 45 per cent. is now in leys, and I imagine mostly good. Obviously a very large proportion of the permanent grass of to-day is the leave-over from the wheat and the plough. And what a contrast here! On the one hand the Somerville basic slag pastures, and on the other, as if to accentuate the virtues of slag, those that have been left to go from bad to worse—just *Molinia* and *Nardus* pastures, and now they require much more than slag to rejuvenate them. But yet how easy to improve! In Glamorgan the reversion is a matter rather of fields than of great blocks of country as in Northumberland. These dreary acres in both counties, however, constitute incongruous gateways to densely populated industrial centres.

The reversion has gone as far as *Molinia* and *Nardus*—here in great blocks, there in terms of single fields, and to the extent of a very large acreage in the aggregate—all through Cumberland, Westmorland, parts of Durham, Yorkshire, Lancashire, Derbyshire, in all the Welsh counties and in parts of Devon and Cornwall—and with reversion in most cases the fences have also gone. Gone, too, the plough, and, with the plough, enterprise, followed all too often by dilapidation of homestead and buildings.

That is one type of reversion: the other is bracken and rushes, equally the offspring of neglect. Where bracken has completely invaded enclosed fields, where the surface of such fields is not unduly rough, and cutting would not be attended with any insuperable difficulties, we have a very good example of long-

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continued neglect. In some areas whole fields together have reverted in this way. Such a happening is frequently associated with the abandonment of isolated hill farms, or of shepherds' homesteads—it is associated too with the running together of a number of small farms into a large parent holding. Apart from these causes, bracken in recent years has gained very considerably on fields bordering on woodlands and rough grazings. Bracken-invasion is, however, by no means confined to poor and hilly land, large patches often occurring on good lowland fields.

I cannot offer any estimate as to the acreage of bracken on the permanent pastures of England and Wales as a whole. I can, however, give an example based on a field-to-field survey covering in all about 3,703 acres and representing twenty-two farms in Radnorshire. The farms in question stand between the 800 ft. and 1,000 ft. contours. Only 'enclosed' fields were included in the survey. Even at this elevation not many years ago wheat was grown to some extent for home consumption; now, however, the plough is not active, the pastures are outrun, and fences are largely broken down or in a poor state of repair, in many cases four or five 'fields' being run together. As much as 18 per cent. of the total acreage of the twenty-two farms is at present in bracken. In the case of one large farm of 400 acres no less than 100 acres had reverted to bracken. This example, typical of much land in Wales and of not a little over the English border, illustrates the extent to which high land of much intrinsic value, not particularly steep and not long ago well farmed, is reverting to rough grazings. The same state of affairs is apparent in parts of Merioneth. Thus, in the case of fourteen farms with an aggregate of 2,997 acres standing between the 500 and 900 ft. contours, 600 acres (20 per cent.) had reverted to bracken. All this bracken was on comparatively easy gradients.

The acreage under rushes on the permanent grasslands of this country is surprisingly large, and from many quarters I receive information that in quite recent years there has been a noticeable increase. For example, I am given to understand that on the Norfolk marshes rushes are gaining ground because of a diminution in the number of cattle fed on the area as a result of unremunerative prices.

REVERSION TO BRACKEN AND RUSHES

Rushes (and I am not now referring to the maritime rush) are perhaps most abundant on estuarine flats at almost sea level, subject to periodic flooding, and on such areas are no doubt extending as a result of insufficient attention to water courses. In these situations rushes may occur in great blocks of ten to fifty or more acres together. Such areas are noticeable on the marshes between Barmouth and Fairbourne, for example, and abutting on the salt marshes on Borth Bog in Cardiganshire. Considerable areas of the Bridgwater Flats and low-lying land around the Parret Marshes are infested with rushes. The same is true of the flats in Monmouth on the north bank of the Severn. For example, near Bishton there is a large tract of land—nearly 200 acres in all, extending east and west alongside the railway—which is almost dominated by rushes which have been making rapid headway in recent years. Rush reversion is also a prominent feature of upland fields in the northern counties. In Cumberland I have motored for a mile or two together alongside rushy fields. Apart from whole localities being rush-ridden, there are also innumerable isolated fields under rushes in many grassland districts. In the Vale of Aeron in Cardiganshire, twenty-nine farms were examined. On eighteen of these farms rushes dominated 410 acres out of a total of 1,620 acres (25 per cent.). In the case of these farms the rushes were primarily due to periodic flooding, the trouble being accentuated by the fact that the farmers concerned do not make any concerted endeavour to keep all the waterways clear. On the other eleven farms rushes dominated 158 acres out of a total of 1,315 acres (12 per cent.). In this case surface water was the determining factor, a condition that could be comparatively easily rectified.

In general, rushes denote the need of drainage, but, as I shall show when discussing technique, they can be countered even without resort to costly enterprise in this direction. This is not to decry the need for drainage, which is probably even greater than is indicated by the careful estimates put forward by the Royal Commission on Land Drainage in England and Wales—and for the most part it is permanent grass that is affected. Distinction has to be made between arterial drainage (the primary concern of the Commission) and land drainage—both of equal importance to grassland.

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At the date of the Commission Report (1927) there were at least 1,755,000 acres in immediate need of arterial drainage; 1,279,000 acres were subject to flooding on account of defective channels, and 476,000 acres because of defective main ditches and smaller watercourses. Most of the land in need of arterial drainage lies east of a line drawn roughly from Middlesbrough to Watchet. Striking evidence as to the widespread need of some form of ground drainage, particularly on clay soils (London clay in this instance), is given in a report on the results of a grassland competition conducted in the Barnet district (south-east of Hertfordshire and north-east of Middlesex). In all, thirty-two farms totalling 5,800 acres come under notice. Of this area 57 per cent. of the land situated in Middlesex and 40 per cent. of that in Hertfordshire was in urgent need of drainage. These figures are eloquent of the state of affairs, for they represented obviously not the worst, but the better, grasslands of the district, since the evidence refers only to those farms entered for the competition.

It is only local and field-to-field surveys of this sort that can give any idea of the magnitude of innumerable defects from which the grasslands of the country suffer.

General weediness in the aggregate in my opinion accounts for an even greater loss in productiveness on our permanent pastures as a whole than do the innumerable fields that have lapsed completely from grace. Buttercups, although of very general occurrence, are both exceptionally abundant and prolific on land needing drainage, and where present in great quantity reduce considerably the yield of good, honest grass. The acreage of permanent grass carrying buttercups in truly harmful amount is very large. This is a serious defect in most of the grassland on rich alluvial flats, and indeed in the larger proportion of all grasslands that are good but not (and largely because of the buttercups) of the highest quality.

Excessive general weediness—swards in which weeds account for a really large proportion of the total herbage—is associated in a striking manner with certain localities. In all those districts in the north where fields are perpetually cut for hay, the extent to which weeds dominate the vegetation is the outstanding characteristic of the grasslands.

In Derbyshire, in Lancashire, in Cumberland and in North-

EXCESSIVE WEEDINESS

umberland, to say nothing of the Welsh counties, and to mention the more glaring examples only, and especially on the higher lands at various times and in various places, I have walked from field to field in a vain search for a comparatively weedless sward. Literally thousands of acres are involved, and these should be labelled 'weed-land' rather than grassland. Weeds, as I have already said, are low in dry matter content; they are not in themselves productive, and hamper the development of the all-valuable grasses and clovers.

So much for the grosser defects of our enclosed grass fields. I wish I could catalogue for the country as a whole the acreage (and I am at present concerned with farm lands and not with the rough and hill grazings) under bracken, under rushes, in *Nardus* and *Molinia*, and that really very large area which is excessively weedy. The examples I have given are sufficient, however, to indicate that it would not be a case of merely some thousands of acres, but that the total area occupied by such grasslands would probably account for more than one-eighth, and perhaps for nearly one-quarter, of the permanent grass of England and Wales, and I should certainly not be surprised if it exceeded $2\frac{1}{2}$ million acres.

If we now examine well-known districts where the grasslands are generally considered to be of high, or at least of good, quality, we shall find in most instances that a very large proportion of the fields are in swards that do not attain to the rye-grass standard, and are of relatively poor productivity. It is exceptional to find that a large percentage of the fields can be classed as first-grade rye-grass pastures. I will give typical examples based on accurate field-to-field surveys.

The Glamorganshire Dairy Pastures. Some 3,800 acres were examined in the Vale of Glamorgan, about three miles south of Cowbridge in the Llanmaes-Flemingston district. Here none of the fields could be classed as good rye-grass pastures. Thirty per cent. contained some rye-grass with *Agrostis* the dominant species, while 50 per cent. were *Agrostis* pastures (devoid of rye-grass) pure and simple. Five per cent. of the fields contained rushes in moderate or considerable excess. Arable farming is still in evidence in this district, about 11 per cent. of the area being in crops. A very large proportion of the grass fields are in

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fact leys that have been allowed to run on into permanent grass during the past 30-40 years, and have never been properly put down to long duration pasture, which undoubtedly has much to do with the poorness of the swards.

The Carmarthenshire Dairy Pastures. A block of about 2,500 acres was examined in the St. Clears district. Here 43 per cent. of the area consisted of *Agrostis* pastures devoid of rye-grass; 39 per cent. contained some rye-grass with *Agrostis* still the dominant partner. Good rye-grass pastures accounted for 5 per cent., but none of the fields attained to the highest standard. Ten per cent. of the fields contained considerable quantities of rushes. The amount of arable farming in the district is now almost negligible, only 2 per cent. of the fields being in crops.

The Ayrshire Dairy Pastures. About 3,840 acres were examined in the Drongan-Ochiltree district. Here 4 per cent. of the area was in *Molinia* pasture; 51 per cent. consisted of *Agrostis* pastures (without rye-grass); 16 per cent., although *Agrostis* dominant, contained appreciable amounts of rye-grass, and 3 per cent. were good rye-grass pastures, though not of the highest standard. Six per cent. of the fields contained considerable quantities of rushes. Arable farming is in decided evidence, 12 per cent. of the area being in crops and 6 per cent. in new seeds—but despite this the amount of good rye-grass pasture was surprisingly small.

The Cheshire Dairy Pastures. About 3,840 acres were examined in the Faddiley district (6 miles from Nantwich). Here only 9 per cent. of the fields were downright *Agrostis* pastures (without rye-grass); 42 per cent. contained some rye-grass with *Agrostis* dominant; 37 per cent. were good rye-grass pastures with a few fields attaining to the highest standard.

The Buckinghamshire Dairy Pastures. About 3,840 acres were examined in the Winslow-Swanbourne district. Of the dairy pastures brought under review, this area contained the best pastures; on the average they were better than those of Cheshire. Eight per cent. of the acreage consisted of first-grade rye-grass pastures, and only $3\frac{1}{2}$ per cent. of *Agrostis* pastures with no rye-grass. Forty per cent. consisted of much *Agrostis* with some rye-grass, and 41 per cent. were good rye-grass pastures.

The Leicestershire Fattening Pastures. The Langtons-Shangston

THE CONDITION OF DAIRY PASTURES

district was selected, and 3,840 acres were examined. Here are some of the best pastures in the country, 41 per cent. of the area actually being classified as first-grade rye-grass pastures; 43 per cent. as good rye-grass pastures. Even in this district 10 per cent. of the acreage consisted of fields dominated by *Agrostis* with some rye-grass, and 3 per cent. dominated by *Agrostis* without rye-grass.

An interesting feature, exhibited to a greater or lesser extent in all of the above districts, was the fact that the recently sown pastures are not providing swards which approach the old pastures in botanical composition. There is sufficient evidence within the areas themselves to show that lack of good establishment of the seeds mixtures is not the cause of failure, which is due to the composition of the mixtures used and to faulty management. Indigenous (leafy and persistent) perennial rye-grass has not been employed, while the tendency has been to take heavy hay crops during the early years of the leys—the significance of these errors will be made abundantly clear in subsequent chapters.

From the evidence that I have brought forward as to the characteristics of our fields in permanent grass it must be obvious that they vary over the widest possible margin in productiveness, and we must now examine the matter from this point of view. Sir Thomas Middleton has estimated that the richest fattening pastures, without the assistance of oil cake, in average years would produce from 180-200 lb. of meat per acre per annum, and he adds that he would be surprised if there were more than 500,000 acres of grassland in the country which, without the help of concentrated feeding stuffs, could fatten one bullock per acre on the average of a series of years. Many of the poorer types of pasture—for example, those on clay soils which have responded so well to basic slag—Sir Thomas Middleton estimates as producing (in their unimproved condition) perhaps 20-30 lb. of lean meat per acre in the course of a year. The production of the ordinary pasture Sir Thomas would place at no more than 90-100 lb., and he considers, if both quality and quantity are taken into account, that the best pastures produce quite three times as much as the average, and are ten to twelve times as productive as the poorest—the poorer of the *Agrostis* pastures. He sums the matter up by expressing the view that, taking our

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permanent grasslands as a whole and in terms of hay and pasture, the nation does not derive more than 72 lb. of meat or 133 gallons of milk per acre per annum from her grasslands.

It has also to be remembered in this connection, as I have already indicated, that an appreciable proportion of our permanent grass has lapsed to a condition below the *Agrostis* standard, and is now no better than the average of the rough grazings, and as to these latter it is generally considered that they vary in production from no more than 5 lb. of lean meat per acre per annum to not much more than 15 lb. Some of the better areas on the hill grazings at elevations not above about 1,100 ft. are, however, capable of very decidedly higher production than this. Thus, in connection with experiments with which I was concerned some years ago in Cardiganshire, we obtained from 12-40 lb. lean meat per acre per annum, but taking the rough grazings as a whole it is probably a fact that over a very large area production falls below 10 lb. per acre per annum, and this would be equally true of the permanent grass fields that have completely deteriorated and almost completely gone out of use. It follows, therefore, that the range of productiveness of our grasslands is of a different order altogether from that of fields maintained in crop production.

Interestingly enough we have striking confirmation of Sir Thomas Middleton's estimates if we take as our criterion yields of dry matter (obtained in terms of pasture grass) per acre per annum and the chemical composition of the dry matter of pastures of various types.

Trials conducted in Wales have shown that the yield in dry matter of herbage from fairly good permanent pastures (but pastures appreciably below the fattening standard) has been eight times as great as from fescue and *Molinia* pastures. Trials conducted on representative pasture types in various parts of England, Wales and Scotland have shown fattening pastures yielding up to about seven times as much as poor *Agrostis* pastures. The results of both sets of trials tend to confirm the justice of the classification of pastures made in a previous chapter, and indicate that, in general, the rye-grass outyield the *Agrostis* pastures, and that the latter are more productive of dry matter than the fescue, *Molinia* or *Nardus* pastures.

THE FATTING PASTURES

Concomitant with the greatly reduced yield of the poorer pastures is a very decided inferiority in nutritive value of the dry matter as indicated by chemical analyses. The figures given below, based on analyses made by Professor Fagan, are typical and show the range of differences that are normally encountered:

ANALYSES BASED ON DRY MATTER

	Sample	1	2	3	4	5
Nitrogen	-	3.47	2.90	2.42	1.98	1.57
Phosphoric acid (P_2O_5)	-	0.94	0.76	0.59	0.44	0.26
Lime (CaO)	-	1.26	1.12	0.81	0.39	0.32
Silica-free ash	-	7.90	7.74	5.82	3.26	2.48

Sample No. 1 represents a good permanent pasture in the Wye Valley; Sample No. 2 represents a second-rate, and Sample No. 3 a third-rate lowland pasture; Sample No. 4 represents a fescue pasture, and Sample No. 5 a *Nardus* or white grass pasture.

The figures as to yield, taken in conjunction with the chemical analyses, thus serve to substantiate the correctness of Sir Thomas Middleton's evaluation of the several grades of pastureland.

The crux of the whole matter is the extent to which the gulf between the various types can be bridged. Strange as it may seem, no great amount of reliable evidence exists on this point, but when dealing with the financial aspects of land improvement I shall have no difficulty in showing that pasture improvement can be carried a very long way, and that we need not wholly despair of even those acres that have been allowed to deteriorate.

In all this chapter on grassland I have scarcely mentioned the word soil, or referred to geological formation, not that they are of no importance. To a very real extent grassland is singularly independent of the virginal character of the soil. Soil type is, however, a pre-disposing cause towards either good or bad grassland, but good management and adequate manuring can lead to the development of tolerably good grassland on any soil which Great Britain has to offer, while bad management will mask the virtues of the most beneficent soil.

If we look at our grasslands as a whole, there is no escaping the fact that it is primarily management or mismanagement that has made them what they are. Most of the ordinary poor (the *Agrostis*) pastures are on land once under the plough and under

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the plough before artificial manures were used in great quantities or with much knowledge. The continual taking of crops was therefore responsible for considerable soil impoverishment, long before the fields went down to grass. When in grass, the fields either had to produce milk or growing animals, and the majority of such fields have been called upon to do so, some for twenty, some for well nigh fifty years without anything like adequate returns in manure, with the consequence that they have been further and continuously drained of fertility. The continuous taking of hay without adequate returns in manures—the general rule—has precisely the same effect. The fattening pastures, on the other hand, have not had to rear stock or deliver up hundreds of gallons of milk. Adult, full-boned and stately animals have been brought on the fields to fatten, and, helped by cake, the grazing management has been good, and the fields have progressively improved. Some at least of the Leicestershire and Northampton fattening pastures are not permanent in the sense that most of those on alluvial flats are permanent—they were under the plough in the 'seventies,' and did not develop into fattening pastures all in a minute.¹

Management, again, has been the decisive factor in the case of the pastures fallen back to *Molinia* and *Nardus*—the soils are poor and the pastures could never be first-class, but under proper manuring and ordinary sensible management there is no reason why they should not be up to the *Agrostis* standard, and therefore useful, instead of almost valueless.

Without an accurate field-to-field survey of all the permanent grass of the country, it would be impossible to estimate with precision the extent of the increased performance of which as a whole our pastures and meadows would be capable in terms of milk, meat and wool. When we take into account the yearly wastage in summer grass never eaten, the normal loss of nutritive material in hay making,² the tons of *Molinia* never con-

¹In 1871 Leicestershire and Northampton (including the Soke of Peterborough) together returned 550,039 acres of permanent grass; in 1931 the amount returned was 882,855 acres.

²The losses of nutrient material consequent upon hay making vary enormously. Under ideal conditions they might be as low as 10 per cent., while total loss is by no means unusual. The average loss is estimated at 25 per cent.

verted—and then contemplate Sir Thomas Middleton's estimates in the light of such evidence as I have been able to produce as to the present day condition of our grasslands, and in the light of the enormous scope that demonstrably exists for the improvement of the poorer types—the preponderant acreage—what are we to think? I think, with Sir Frederick Keeble, that there is not the least doubt that the aggregate productivity of our acreage in permanent grass could be increased two-fold as permanent grass. If, however, a considerable proportion of the area now devoted to permanent grass were diverted to the production of high-class long-duration leys, then I think we could safely look forward to a three-fold increase in productivity. What could be done is, however, of less immediate consequence than what should be attempted. I cannot believe that in this small country it is possible to justify on any grounds the continued maintenance of so vast an acreage of marginal land, the condition of much of which renders it unsuited to respond immediately to any urgent demands that may suddenly be made upon it.

Despite our enormous area under grass, and despite the fact that there is relatively little first-class grassland in the country, there are those who would have us believe that Great Britain 'is not agriculturally an undeveloped land'. As to whether land under grass is being used to good advantage or not depends entirely upon the productive capacity of the grass as such in relation to its potentialities. I should doubt if marginal land is justified under any circumstances, or in any country, unless helped into, and then maintained in, a dynamic condition; that is to say, unless fertility is assisted to accumulate, and unless enough attention is bestowed upon the land to prevent it reverting to a state that would subsequently necessitate acts of reclamation as great as, or even greater than, those which first brought it into usefulness.

CHAPTER VII

Resources: Woodlands

The Forestry Commission. Surveys of the past. The Crown woods. High forest and coppice. Felled areas and replacements. Causes operating against re-planting. New plantations. Co-ordination between afforestation and land improvement. Importance of balance. Large units and small units. The agricultural and aesthetic aspects of afforestation. Shelter belts, fencing posts. The broad-leaved trees.

THE history of our woodlands, like that of our grasslands, has been one of long-continued neglect, and of sporadic and local endeavours to introduce and practise improved methods. Afforestation in the post-war period has, however, in one very important respect been placed in a much more favourable position than grassland. The Forestry Commission not only foster research and promote activity relative to trees but also plant them. Research relative to grassland is fostered by the State, but there exists no Commission with executive authority and cash to put the results of that research into practice. It is highly significant as bearing upon the whole question of land reclamation and improvement that the fostering by the Forestry Commission, although backed by grants-in-aid, has led to comparatively little private planting, for only about one-third of the total planting during the first ten years of the Commission's activities has been undertaken by private owners aided by grants from the Commission; the remaining two-thirds having been planted by the Commission on land of which the State has taken possession.

At the best, the would-be (or the might-be) grassland improver has been shown how to act—he has not been asked, still less helped, to act. Land improvement carried into the poorest of lands, like afforestation (itself an act of reclamation), is a long-term undertaking, and it is an undertaking which the experi-

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ence of the Forestry Commission suggests is far from attractive to private owners.

The State, however, in the past has been more neglectful of its own forests, far more neglectful perhaps than even the landowner of his plantations or the farmer of his lands—the lands of this country have inherited a number, indeed a vast number, of white elephants as legacies from the past. A survey conducted in 1608 had recorded about 124,000 trees fit for the Navy, while the survey of 1707 could only report 12,479. The Royal Forests were woefully neglected during the eighteenth century, and were drawn upon to such an extent during the wars for ship's timber and fuel that in 1815 they had a smaller supply of good timber trees than at any time in their history.

An active policy of planting was in consequence pursued in the Crown Woods for the first three decades of the nineteenth century, but even this was not continued, and there was no truly national policy until after the war.¹ A considerable amount of private planting had, however, followed upon the heels of the agricultural developments towards the middle and end of the eighteenth century. To-day, however, the condition of the privately-owned woodlands as a whole, including areas felled in the war and not re-planted, is probably worse, and certainly no better, than that of the Crown Forests—now under the care of the Forestry Commission.

Of the 2,958,672 acres of woodlands in Great Britain in 1924, only 47·9 per cent. consisted of high forest—much of this is not fully productive. The best timber was felled during and immediately after the war. Over 800,000 acres, which represent no less than one-quarter of the nominal woodland area, consist of scrub and felled woodlands—this area produces nothing. Coppice (with and without standards) accounted for 17·9 per cent. of our woodlands, and under modern conditions such timbers are of very little economic value. The outstanding fact revealed

¹The importation of timber was about equal to that of grain in 1913, and in quantity these headed the list of imports and between them absorbed one-quarter of the available shipping. It was this fact—the calls on tonnage—rather than the deplorable state of our woodlands as such which was the decisive factor which led to the setting up of the Forestry Commission immediately after the war, and which directed a policy of planting *de novo* on new ground rather than at all costs resuscitating the existing woodland areas.

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by the census of 1924 is that, leaving out of account some 204,293 acres of amenity woods (shelter belts, park timber, etc.), no less than 1,337,489 acres of the woodland area were of little or no economic value, and much of it was completely derelict. This figure is of the greatest importance in relation to the programme of the Forestry Commission, and in relation to land reclamation *via* the improvement of grassland.

The Royal Commission on Coast Erosion and Afforestation in the sumptuous days before the war advocated a programme of planting 6-9 million acres in sixty or eighty years. In arriving at this estimate the Commission had in mind the fact that our acreage in woodlands is very small compared with other European countries—only just over 5 per cent., while that of Germany is 26 per cent. and France 17 per cent. The Acland Committee (1916-17), on the recommendations of which the Forestry Commission's programme is based, was content to advise the planting of 1,770,000 acres in eighty years (1,180,000 acres to be planted in forty years) on land not previously in woods, and also insisted upon the need of maintaining in an enhanced condition of productiveness the 3,000,000 acres already scheduled as woodland. In so far as the planting on new land is concerned, the Forestry Commission is substantially abreast of the Acland recommendations. During the first decade of its activities the Commission planted, on land acquired for the State, 130,786 acres of conifers and 7,511 acres of hard woods, and assisted (by grants-in-aid) individuals and local authorities to plant 76,736 acres. Of the land acquired during this decade by the Commission only 76,200 acres consisted of devastated woodland and coppice, so that even if a substantial proportion of the land planted by individuals represented woodland areas, the amount of re-conditioning undertaken during the period 1919-1929 was lamentably short of what is necessary to make an appreciable impression on the felled, scrub and coppice areas. The programme for the second decade now in process of realization only contemplates 23,000 acres of replacements as against 330,000 acres of plantations on non-woodland areas. If all the planting had been confined, and still were confined, to woodland areas, and at say the average rate of 30,000 acres per annum, the reclaiming and re-planting of the felled areas would

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now be practically completed. The felled and scrub areas together would demand eleven more planting years, while to reclaim and replace the 1,337,489 acres in coppice in addition to the felled and scrub areas would take forty-four years in all, and, therefore, would not be completed until 1963. In fact, however, the main bulk of the Commission's planting is on new ground, and even if all the private planting took the form of replacements, re-conditioning would not be proceeding at more than 15,000 acres per annum; in actual practice it is very doubtful, however, if private planting is keeping pace, or will keep pace, with current private felling.¹ Thus, effective replacements are reduced to the Commission's negligible efforts of 23,000 acres in ten years, or to a replacement rate of 2,300 acres per annum. If, therefore, we consider the land as of prime importance, and afforestation as one of the means of land reclamation, the present state of affairs is extremely unsatisfactory. It is the more unsatisfactory because, in the first place, land in scrub, stump and coppice is of little grazing value, and exceedingly difficult and expensive to improve for agricultural uses; and in the second place, because a very great deal of the new land taken over by the Forestry Commission is most improvable from the grazing point of view. It is equally unsatisfactory from the forester's own point of view, for as the Commissioners remark '... derelict forest land is frequently better suited than bare heath or moorland for timber production' and they wisely add 'moreover its planting entails no disturbance of existing land utilization'. The present state of affairs arises from no fault of the Commission. It is due to three main causes. Primarily, I think, to the fact that the dictum laid down by the Royal Commission on Coast Erosion and Afforestation, to the effect that on hill land capable of being planted 15 lb. of mutton per acre per annum would be the most that such land could produce. This has been accepted without question as axiomatic and true, if not for all time, then at least for 60-100 years. The dictum is not true, and, as will transpire in subsequent chapters, an expenditure per acre of no more than that demanded by afforestation would be competent to alter entirely the stock value of such country. Perhaps if this

¹For the forty years previous to 1924 private planting had averaged about 12,000 acres per annum, and in 1924 was proceeding at about that rate.

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fact had been realized, the Forestry Commission would have reacted somewhat differently to the two further causes which make the re-conditioning of derelict woodlands more difficult to put into operation than the planting *de novo* on new ground. I refer, firstly, to the inconvenience of dealing with innumerable—and often small—scattered areas, and secondly, to the fact that the exercise of some compulsory powers would be necessary—compulsory purchase or the compelling of a man to accept grants and to replant.

From the point of view of land utilization as a whole, and a considered programme for the land, it would have been more in accordance with long-sighted policy to have concentrated first on the derelict woodlands. To have done this, despite the possibility of a heavier initial expenditure, and even if such a plan would have entailed somewhat drastic legislation.

I am raising what I conceive to be an exceedingly important issue, and in no spirit of criticism; but because it is not at all unlikely that mainly in order to give increased employment the Government of the day (of some future day) might decide to embark upon a greatly extended afforestation programme.

I am not averse to the taking of new land for planting when such a course becomes necessary, and provided that such land is chosen, having regard to all the various possibilities for utilization and improvement in every direction while subject to these reservations, I should favour an extended programme of afforestation.

I have already alluded in my chapter on vegetation to the question of the balance of country. In a small country with only a limited land surface, balance assumes very great importance—an importance which becomes of added significance in the case of land taken for afforestation. Land once planted is condemned to produce timber for a great number of years, and is difficult finally to bring back to pasture or other agricultural usage. This fact is well illustrated by the researches and endeavours relative to de-afforestation (the grassing out of felled areas) now in active progress in Sweden.

The question of balance is perhaps most important in the case of the afforestation of large areas of the rough and hill grazings. The researches of the forester, on the one hand, are showing the

IMPORTANCE OF BALANCE

means of extending profitable planting on such areas, while on the other, the agronomist is finding the means of vastly improving the grazings. Co-ordination is perhaps most important where potentialities are concerned—and here we are dealing essentially with potentialities and with long-range activities which only after a considerable lapse of time can be brought to fruition.

Both forester and agronomist can produce the best results on the same general types of land, for example in the case of *Molinia* country both prefer areas with but little *Scirpus*. At present the forester does not care to exceed the 1,500 ft. contour. The forester also desires to plant in considerable blocks, and this means that in hill country there is a tendency to leave isolated islands of tops cut off from what were formerly considerable sheep walks, all the lower portions of which will have been afforested. The problem of the grazier is wintering, and the general health of his animals, while he should also explore the possibilities of being able to fatten some proportion of his lambs and wethers. He therefore needs to concentrate his improvements on the lower lands, but just in proportion as he can improve his lower lands so will he have the more need of his top lands—for healthy summer grazing. He must not over-graze his lower and wintering lands during the summer. Further, the top lands, though apparently unsuitable for afforestation, in many instances are capable of being improved and rendered more healthy (more mineral-efficient) for summer grazing, and are also in many instances able to contribute to the wintering. Islands of top lands having little or no access to bottom lands are quite useless except, as the Forestry Commission realize, for amenity purposes. For those latter purposes they would be just as useful if an integral part of a sheep walk, and if their grasslands were in part, or wholly, improved.

The Forestry Commission is drawn increasingly towards the hill grazings, because such land is cheap and acquisition does not present great difficulties or demand resort to compulsory powers, and on such land they can usually acquire comparatively large contiguous blocks.

This question of balance cannot be ignored, and particularly so if the afforestation programme on fresh lands were to be at all appreciably extended. In my view two alternatives present

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themselves. The afforestation of new land should be conducted either in terms of much smaller or of much larger units.

Both alternatives present difficulties. The acquisition of land would be more difficult in the former case, and, in order to acquire the necessary land, the Forestry Commission would probably need to administer an even greater area of non-afforested (non-afforestable and not-to-be-planted) land than they do at present.

If the smaller unit (areas frequently less than ten acres and in some instances no more than five acres) method were adopted in hill country the aim would be not to unbalance any of the sheep walks. Where afforestable, the steeper and the more rocky hillsides would first be selected at the lower elevations for planting, and only such portions of the easier lowland would be planted as would not seriously interfere with a well considered plan for the improved grazing of the walk as a whole. Where compatible with timber production the plantations would be so orientated as to provide the maximum amount of shelter for stock. The small unit of course would make operations more difficult, and more costly, particularly so when it came to felling and conversion, but if a great many small units were aggregated into a single district, these disadvantages could, I believe, be combated and on an economic basis. In this connection the tractor and modern methods of haulage make a great deal of difference, while it must be borne in mind that improved road and track facilities are as important for the land improver as for the forester.

By a large unit I would mean creating a considerable forest, not much less than 80,000, and possibly even exceeding 200,000 acres in one block. Such a block as far as possible would be wholly afforested except for an appropriate number of forest-holdings for the permanent workmen. To acquire such a block of hill country might necessitate the taking over of a certain amount of moderately good land at comparatively low elevations. This would afford the forester an opportunity greater than he has at present for extending the range of his silviculture. On the other hand, if a huge contiguous block of hill country was taken over upon which to develop a forest in the real meaning of the word, a considerable acreage of very poor land would have

LARGE UNITS AND SMALL UNITS

to be planted, some of it at higher elevations than those to which the forester now ventures (Scots pine land perhaps). In relation to the economy of the forest as a whole the slow maturing of certain sections would not be of much significance—and timbers of all grades would necessarily be produced.

I have made these two suggestions—the small unit and the large unit—because I feel so strongly that perhaps the greatest of all crimes that can be perpetrated upon the land is to upset balance—and that is what in all directions and in all connections is taking place to-day. To avoid doing so, and to endeavour to decrease the possibility of doing so, would seem to me to be of sufficient importance to demand an immense amount of thought, a large expenditure, and, if need be, far-reaching legislation.¹

There remain the agricultural and aesthetic aspects of timber planting—no statutory concern of the Forestry Commissioners whose terms of reference are to produce timber. From the agricultural standpoint shelter belts and fencing posts are perhaps the two outstanding needs; and I think urgent and growing needs. As far as possible fencing timber should be locally produced, and shelter belts are essentially a local matter. From the point of view of the carrying capacity of hill country, the whole question of shelter belts—their orientation, their composition, their relation to timber production as such and their special relation to fencing material—is a matter demanding immediate investigation and enquiry.

The British landscape is essentially a varied landscape—a very great deal even of our upland country is neither hard nor

¹The Forestry Commission I understand contemplates establishing a large forest in the Cheviot district, but not one running to as much as 100,000 acres. As I shall show in my next chapter, the extended Cheviot Hill district affords unique scope for grassland improvement on a large scale. In my view this district should either be almost wholly afforested, making a forest of perhaps over 300,000 acres; or almost wholly devoted to stock, and, therefore, made primarily the concern of the grassland improver. In the latter event a large acreage in the aggregate could usefully be planted, but only in terms of a considerable number of quite small units. The latter plan (and not overlooking the question of the diseases of forest trees) would, I believe, be to the greatest ultimate economic advantage, and most in keeping with our British scenery, but its inauguration would necessitate the closest possible collaboration between forester and agronomist, and an exceedingly detailed preliminary survey.

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forbidding. The broad-leaved trees are essentially British with infinite variability; the conifers are formal, and in large unbroken masses out of harmony with the undulating configuration of our hillsides.

The Forestry Commission has recently shown its recognition of the profound influence of trees on scenery by setting up a consultative committee with representation of the societies concerned with rural preservation, in order, as far as possible, to reconcile the economic with the aesthetic. This is all to the good as far as it goes, but it does not go nearly far enough, for there remains the additional question of planting with the sole aim of maintaining the character of the British country-side. A great deal of purely aesthetic planting, for example, should be undertaken in connection with road making and, as I shall show in a subsequent chapter, in connection with national parks. In order to do this to the best advantage, species of trees and shrubs of little or no economic value would need to be employed, and funds for these special purposes would have to be placed at the disposal of the Commission.

I have endeavoured to show that in so far as afforestation and land improvement are concerned they must both be regarded as parts of the same problem, while aesthetics are always inseparable from all matters appertaining to the land. It is unfortunate, therefore, that when in 1919 the Forestry Commission was set up it was only the timber *qua* timber aspect of afforestation that was considered. It would probably now be difficult, though perhaps not impracticable, to widen the base of the Forestry Commission and to extend its terms of reference to that of land improvement, land reclamation and rural beautification in all their bearings (including, of course, afforestation) and to support such a widened term of reference by increased powers relative to the acquisition of land and by increased financial resources. The Forestry Commission, it will be remembered, administers a large and growing acreage, a considerable proportion of which is not, and never will be, in timber. In September 1932 the net total area of land acquired by the Commission was 709,008 acres, of which 439,885 acres are deemed to be plantable; in addition the Commission administers the Crown Woodlands—120,696 acres, of which 62,554 acres carry timber or are under forest treatment. The

THE BROAD-LEAVED TREES

very success of the endeavours of the Forestry Commission in a too narrow field only tends to emphasize the urgent need of the closest possible co-ordination between all the interests concerned in everything to do with land reclamation and land utilization.

CHAPTER VIII

Resources: Rough and Hill Grazings

The acreage. The influence of height above sea level. Distribution in relation to contour, gradient and vegetation: Scotland, England and Wales. Typical areas in Wales described in detail. Grouse moors and sheep. Land tenure; sole occupation and common right. Acreage commonable. Catchment areas. Outliers. Cliff lands; rabbits.

There are no really accurate means available for tracing the gradual reduction in waste land—now rapid, now more slow—throughout the centuries until it reached the present but ever-fluctuating range of levels. From the productive point of view the amount of waste land, which was far greater in the eighteenth century than it is to-day, has long been, as it still is, a standing reproach to agriculture. Although the acreage for England and Wales is perhaps less than half of what it was at the beginning of the eighteenth century, the reproach to agriculture is no less great, for modern technique and facilities could bring large tracts of the rough and hill grazings to an altogether higher standard of usefulness. In matters connected with reclamation the operation of the law of diminishing returns is subject to constant set-backs, and it is probably easier to-day to break-in land two or three times as difficult and obdurate as could have been successfully tackled by the stoutest heart 150 years ago.

The present acreage is our problem; nearly 13 million acres in Scotland, over 3½ million acres in England, and 1½ million acres in Wales. From the point of view of improvement and utilization, the most important points are: type of vegetation, character of the soil, degree of rockiness and steepness of the hill-sides, height above sea level, and character of the tenure.

The influence of height above sea level varies very appreciably

THE INFLUENCE OF HEIGHT

from district to district, and is always to some extent a function of the size of the massif. It is affected too by the ultra-local weather conditions. There is not a permanent snow line in Great Britain, but there is a permanent rigour-of-winter-climate line, above which life becomes hard, but not necessarily unbearable, for man and beast. This is a line which with research and enquiry, supported by a greatly increased number of local meteorological stations, could, I am sure, be mapped with considerable accuracy, and to very great advantage. Speaking generally, the line is above 1,000 ft. and usually below 1,500 ft. The Forestry Commission's 1,500 ft. contour is a useful standard; land above 1,500 ft. is of less general utility than that below.

In terms of the comfort of man and beast, and the general potential productiveness of land, conditions become progressively easier and more mellow as we descend from the rigour-of-winter-climate line. The conditions will, however, continue to be comparatively hard until a certain lower datum line is reached. Below that datum line height above sea level as such loses most of its significance. My own experience relative to animals, crops, general productivity and winter climate would strongly suggest the 700 ft. contour as the most generally accurate lower datum line.

On this basis, and with a view to forming general opinions as to the potentialities of rough and hill grazings, it is important to know the proportion of land respectively below 700 ft.; between 700 ft. and 1,500 ft. and that above 1,500 ft. Other things being equal—which they seldom are—the most improvable of the rough grazings would be those below 700 ft. and the least improvable those above 1,500 ft. Areas occur, however, at all elevations which are improvable, while comparatively sheltered hillsides abound even at the higher elevations.

In Great Britain there are 3,537,172 acres of land above 1,500 ft., nearly all of which land is of course in rough grazings; 549,335 acres (15 per cent. of the rough grazings) in England, 345,308 acres (20 per cent. of the rough grazings) in Wales, and as much as 2,642,529 acres (20·6 per cent. of the rough grazings) in Scotland. On the basis of these figures we should, therefore, have of rough and hill grazings below 1,500 ft. in England 3,082,911 acres; in Wales 1,379,743 acres; and in Scotland (in-

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cluding deer forest) 10,106,784 acres—large enough acreages from which to select land for improvement!

It will be of considerable interest, on the basis of such evidence as is available, to examine the distribution of the rough grazings in relation to contour. To assist in such an examination I have taken arbitrary areas representing different districts, and within each arbitrary area I have ascertained the acreage of land falling within my contour limits. The county acreages under rough grazing given in the Agricultural Statistics supply further information, while in many cases I have myself traversed typical sections in each area.¹

Although Scotland contributes by far the largest area of mountainland, including deer forests and grouse moors, above 1,500 ft., yet rough grazings in large acreages come down to lower elevations in Scotland than they do in England and Wales, while in many parts of Scotland the amount of land above 1,500 ft. is not excessive. In this connection the northern half of the northern Highlands is interesting. Here out of an area of about $1\frac{1}{2}$ million acres, practically all in rough grazings, there is only 7 per cent. above 1,500 ft., with 47 per cent. below 700 ft., and 46 per cent. between 700 ft. and 1,500 ft. Most of this country is peaty and a fair proportion is on easy gradients. Much of it is in cotton grass and heather, the latter frequently giving place, after burning, to almost pure *Scirpus*. It is obviously capable of improvement; the summer grazing is healthy, though the stock carrying capacity is low. The lambs are all wintered in the south.

The north-west central Highlands (the country west of the Caledonian Canal) is predominantly deer forest and rough grazings. Here out of $2\frac{3}{4}$ million acres of land we have as much as 28 per cent. above 1,500 ft., and 44 per cent. between 700 ft. and 1,500 ft. In Inverness (not all of which is in this area) and in Ross and Cromarty together there are nearly two million acres of deer forest. This area as a whole is rocky, mountainous, and wet, but affords scope for local enterprise in the improvement of small areas.

¹In delineating an area I have avoided lowland obviously under cultivation, and my peripheral line has always therefore been a sinuous one. The figures I give serve admirably to contrast one district with another, and that is my only intention.

SCOTLAND, ENGLAND AND WALES

The Highland area east of the Caledonian Canal is just over four million acres, of which 38 per cent. lies above 1,500 ft., and only 15 per cent. below 700 ft. This area includes the residue of Inverness, the Highlands of Perth, of Aberdeen and of Banff. It contributes a large acreage to the deer forests of Scotland. Take out of this vast area of highland all that is in steep gradients and rock clad, all that is above 1,500 ft., and all that which carries *Scirpus* or cotton grass (not easy land to improve), and there would be a considerable residue left amenable to the easier forms of improvement. It is probable, for example, that an appreciable proportion of the heather and bearberry¹ land in the Spey valleys would lend itself to improvement, and the same would be particularly true of the grass areas around Loch Tay and near Tyndrum—while bracken is abundant in West Perthshire.

Ayrshire, Wigtown, and Kirkcudbright together contribute over 800,000 acres of rough grazings. A very large part of these grazings lies below 700 ft., indeed a striking feature of this country is the extent to which such grazings come right down to the 300 ft. contour. There is much peat with a mixed and poor moorland vegetation and much rocky surface, but as I shall show in a subsequent chapter there is great scope for improvement even on these unpromising situations. Bracken is excessive in many parts of the counties in question. At these low elevations even comparatively small areas of improved grass assume enormous importance relative to wintering.

Argyllshire has over 1½ million acres in rough grazings, and nearly 222,000 acres of deer forest (some of which carries stock and is included in the rough grazing acreage). A great deal of this land is at low elevations, for if we take the area of country S.W. of a line passing from Dumbarton, Inveraray and Portnacroish, including the Knapdale and Kintyre Peninsula, the Isle of Arran and the north-west corner of Renfrew, we shall have about 919,000 acres, only 3 per cent. of which is above 1,500 ft. and as much as 57 per cent. below 700 ft.!

A very large proportion of this land is on easy gradients, and the difficulties in the way of improvement, notwithstanding *Scirpus*, rock and peat, are by no means insuperable. Much

¹*Arctostaphylos Uva-ursi*.

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land has fallen out of use, and has reverted to bracken (particularly abundant in Argyllshire) and to other types of rough grazing.

I now come towards the border country and to land with which I am myself comparatively well acquainted. The Lammermuir Hills N.E. of Lauder are nearly all below 1,500 ft.; they consist in large measure of exceedingly tractable slopes in clean, grassy vegetation, and afford great scope for radical improvement. Land is still regularly ploughed up to 1,000 ft. on these hills, but many of the higher fields have been allowed to revert to poor grass or even to heather and bracken. The Moorfoots and Pentlands give almost equal scope for improvement, but on the latter hills there are probably about 30,000 acres of heather moor.

The land south of a line drawn from Peebles to Selkirk is interesting. To the west we have about 179,000 acres with as much as 38 per cent. above 1,500 ft. and very little land below 700 ft. Here we have steep hillsides and deep-peat hill tops which constitute inhospitable country for the land improver. To the east, and running down south practically to Langholm, we have a great mass of country, most of which is above 700 ft., but comparatively little above 1,500 ft. A fair proportion of this land is in steep slopes, but there is an abundance of tractable saddle-backs that afford admirable subjects for improvement. Over large areas bracken, *Molinia* and *Nardus* are intermingled on a soil not unduly retentive of moisture; and on many slopes where heather has been burned, bracken is rapidly gaining the mastery.

Large acreages of almost pure *Molinia* (with very little *Scirpus*) also occur on relatively dry and tractable ground. In parts of this country *Molinia* appears to be fairly regularly cut for hay. On such areas Yorkshire fog and even white clover, in quite appreciable amount, make their welcome appearance. There has been much drainage by means of open ditches in the past, and these ditches have favoured *Molinia* and tended to repress cotton grass and *Scirpus*. Alongside some of these ditches, and where the grazing has been hard, white clover is wonderfully abundant. All the evidence unites to suggest that here concerted methods of improvement would be easy and profitable.

I now come to what I consider to be perhaps the most im-

provable block of self-contained hill country in the whole of Britain. I allude to what I can conveniently describe as the extended Cheviot Hill district—an area for the most part in Roxburgh and Northumberland, and consisting of over half a million acres, of which 8 per cent. is above 1,500 ft., 59 per cent. between 700 ft. and 1,500 ft., and 33 per cent. below 700 ft. Within this block, and running up to 1,000 ft. or more, an appreciable amount of land is under cultivation, and very much more in the past has so been. The great bulk of this country is, however, in rough grazings. Of the 321,000 acres between 700 ft. and 1,500 ft., I should expect (on the basis of the country I have been over and of an examination of the contours of the 1-inch map) that some 150,000 acres are tractable.

If I were endeavouring to select an area upon which to launch extensive operations, it is the Cheviots I should choose. I would want to operate over the whole area, lower lands as well as higher, for the improvement of the lower and sheltered lands for wintering would be essential, if maximum benefits were to be achieved. Huge areas of this country could be ploughed, vast acreages could be roughed-up, while bracken occurs on easy slopes in large masses frequently exceeding 100 acres together. An interesting feature of many of these bracken slopes is the presence of white clover in appreciable amount—a sure token of improvability. The *Nardus* pastures, altogether too excessive in many places, are developing in the direction of stunted heather; they should be assisted to develop into good *Agrostis* pastures.¹

There are in the aggregate large acreages of rough grazings that could be improved in the Lake District, but, speaking generally, the contours are steep, and an excessive amount of the land is above 1,500 ft. I have taken some 345,000 acres around Keswick, Windermere and the Shap, and find that 23 per cent. is above 1,500 ft. Much of the land in this district is excessively wet, in particular that to the north of Helvellyn.

An interesting area is the high Pennine country, and here, although a large proportion of the ground is above 1,500 ft., a

¹What is here said relative to the Cheviots should be read in conjunction with the views I have expressed relative to afforestation as applied to that area: see in particular the footnote on page 91.

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great deal of the land standing above 1,000 ft., and even over the 1,500 ft. contour, is on tractable slopes and improvable. A block of 487,000 acres gives us 32 per cent. above 1,500 ft., and only 13 per cent. below 700 ft. Here the walled and intaken fields run up to quite 1,300 ft., but they are poor and neglected. Rushes abound to a great extent on the open hill and on tractable slopes. About 30 per cent. of the area as a whole is in heather moor, but *Molinia*, *Nardus*, *Scirpus* and the heath rush occupy large tracts of country at the relatively lower elevations. These areas afford considerable scope for improvement, although there are not very large areas in pure *Molinia* pasture. The area is wet and peaty, *Scirpus* is plentiful, and there are large masses of cotton grass and *Sphagnum* bog.

The Yorkshire moors afford a very wide range of country. The area north of the industrial centres, and extending up to Bowes and Brough, and westwards to Kirkby Lonsdale and Sedburgh includes much high land: 162,000 acres (about 20 per cent. of the area) lying above 1,500 ft. About 79,000 acres of this country are in heather moor (40 per cent. of the rough grazings), while about 47,000 acres are in cotton grass and kindred vegetation. Roughly, 36 per cent. of the grazings, however, are of the *Molinia* and *Nardus* type, with a strong tendency towards excess of rushes. A large proportion of the slopes are tractable, and this is particularly true of a great deal of the country below 1,500 ft. and of a considerable area at higher elevations between Skipton and Hawes, much of which is highly improvable.

As we come further south the land above 1,500 ft. occupies a much reduced acreage. This is true of the Cleveland Hills, and also of the rough grazings between Lancaster and Settle extending southwards in the direction of Preston—on this latter area there are only about 5,000 acres above 1,500 ft. The Cleveland Hills and the moors of the north-east of Yorkshire nowhere attain to 1,500 ft., the moors are chiefly on land ranging from 600 ft. to about 1,000 ft., the highest land not being much over 1,400 ft. The gradients are steep on the moor edges, while the tops are for the most part in heather with interesting transition areas following burning. The peat is very deep in some places. Nearly the whole area of 172,000 acres is grouse (heather) moor: much of it could be turned into good grazing lands.

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The extensive areas of moorland and rough grazings in East Lancashire and Yorkshire around the industrial areas only give us 13,000 acres above 1,500 ft.—the great bulk of these lands is between 700 ft. and 1,500 ft. Heather is more limited in this area. The larger proportion of the grazings (44 per cent.) is in cotton grass and kindred associations, unsuited alike to grazing and game. The grass areas (about 36 per cent.) consist largely of *Molinia* often with much *Nardus*, *Scirpus* and heath rush. There are, however, extensive tracts of ideal land for improving in this zone, particularly among those areas already intaken.

The Peak District and the areas immediately to the north approximate to 460,000 acres in all and only give about 6 per cent. above 1,500 ft. Between 1,000 ft. and 1,600 ft. there is much heather moor—about 43,000 acres. The lower slopes are largely in grass, *Nardus* occupying a very large acreage, while rushes are often abundant. There is a considerable area in tractable gradients, and the district as a whole affords scope for improvements conducted on a considerable scale—the enclosed farm lands could be much extended.

In Devon and Cornwall, Bodmin Moor, Dartmoor and Exmoor afford in the aggregate large areas of rough grazings. The whole of Bodmin Moor, consisting of nearly 80,000 acres, is below 1,500 ft. The vegetation consists largely of stunted heather with *Molinia-Nardus*, great stretches being on easy gradients, admirably suited to the land improver. Dartmoor is exposed as a whole and there are 35,000 acres above 1,500 ft. There is a considerable amount of rocky surface, but still a large part of the moor is tractable, and there is opportunity for a very appreciable amount of local improvement and reclamation. Bracken and heather are intermingled over large tracts, and there is much clean *Molinia* pasture.

Exmoor, despite the activities of the Knight family, still affords much scope for the unborn pioneers of the present century. There is but little more than 2,000 acres above 1,500 ft., and a large proportion of tractable ground is in *Molinia* pasture.

I now come to Wales, where I have available much more detailed information than for other parts of Great Britain, and where I know large tracts of the country intimately.

The land south of the Dovey affords greater opportunities for

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radical improvement than does that of North Wales, and this despite the fact that there is practically as much land above 1,500 ft. in Radnorshire and Breconshire together as there is in the mountainous counties of Caernarvon and Merioneth.

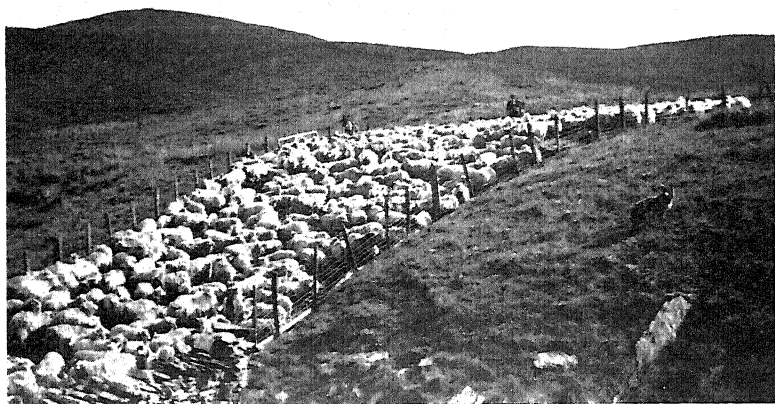
Much of the high land in Radnor and Brecon is, however, easily tractable. Cultivation in these counties is already considerable up to the 1,000 ft. contour, and in several places extends above 1,100 ft.

The amount of high land over large areas in Wales is proportionately as great as in the mountainous regions of Scotland, the Lake District and the Northern Pennines. Thus, for example, in the Snowdonia area (about 160,000 acres), 31 per cent. lies above 1,500 ft. The core of high land running N.E. to S.W. from Llangollen to Towyn, an area of 238,000 acres, has 30 per cent. above 1,500 ft. The Plynlymon massif to the south has an area of 144,000 acres, and gives 14 per cent. above 1,500 ft., with 63 per cent. between 700 ft. and 1,500 ft.

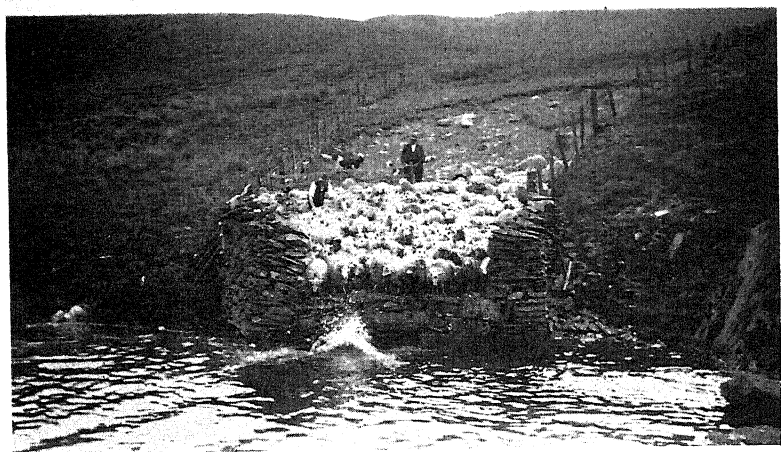
It will be of interest to give further particulars of a few areas typical of the various sets of conditions, as showing the position relative to improvement in Wales.

The Hiraethog Area. This is a block of about 66,000 acres north of a line drawn from Corwen to Bettws-y-Coed. It is of an easy general contour, and lies mainly between 700 ft. and 1,500 ft. About half of the area is in heather moor, much of which is good grouse moor. About one-sixth is wet and marshy and largely cotton-grass moor. About one-fourth of the area is in *Nardus* pasture with excess of heath rush, and, as is usual in North Wales, with very little *Molinia*. Taking the block as a whole, large areas are dry and tractable and definitely improvable, but from the point of view of development it is not well served by roads.

The Arenig and Berwyn Mountains Area. These are highland areas with a great deal of heather moor and wet and boggy *Scirpus* and cotton-grass moor. On the steep slopes there is much *Nardus*-heath rush pasture, some of which is on sufficiently tractable land to afford scope for improvement. On some of the slopes, especially on the S.E. of the Berwyns, there are good fescue-*Agrostis* pastures, but bracken is gaining ground rapidly, and extends in considerable masses to as high as 1,600 ft.



Mustering hill sheep



Washing hill sheep

TYPICAL AREAS IN WALES

Snowdonia. The problem of grassland reclamation at the lower elevations is important. In the past much of this land has been fenced and maintained as good 'ffridd' (=rough grazing fenced off into paddocks but not cultivated). The tendency now is to neglect the fences and to graze on a ranch basis, with the result that bracken, gorse, hawthorn, birch and scrub oak are gaining ground rapidly—so rapidly indeed that at the present rate of regression a really large acreage will soon be nothing but scrub.

The Plynlymon Area. This is the area which I have selected for my National Park, and upon which a detailed survey has therefore been conducted. It will be of much interest to show the contribution of the main types of vegetation and of cultivated land (enclosed land cropped or in comparatively clean pasture) at each range of elevation. The data are set out hereunder:

Below 700 ft. (22 per cent. of total area).

Cultivated land	-	-	-	-	76 per cent.
Chiefly bracken with gorse in some places	-	-	-	-	24 „

700 ft.-1,500 ft. (64 per cent. of total area).

Cultivated land	-	-	-	-	21 per cent.
Bracken	-	-	-	-	23 „
Fescue- <i>Agrostis</i> pasture	-	-	-	-	5 „
<i>Nardus</i> pasture	-	-	-	-	10 „
<i>Molinia</i> pasture	-	-	-	-	37 „
Heather and cotton grass	-	-	-	-	4 „

Above 1,500 ft. (14 per cent. of total area).

<i>Molinia</i> pasture	-	-	-	-	25 per cent.
<i>Nardus</i> pasture	-	-	-	-	61 „
Heather and cotton grass	-	-	-	-	14 „

The extent to which the cultivated land exceeds 700 ft. is interesting (there are 19,000 acres above 700 ft.) and typical of the hill lands of Wales. Much of this land is, however, going back and is being invaded by bracken—but a fair proportion of the bracken is on steep hillsides that have not been cultivated, and, as on the Berwyns and in Snowdonia, marks a sad deterioration of the *ffridd*.

The small area under heather moor and cotton grass is in marked contrast to large areas in North Wales, on the Yorkshire

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moors, the Northern Pennines, and in Scotland, and is typical of Central and South Wales. It is of interest to note that above 1,500 ft. the *Nardus* pastures are more abundant than the *Molinia* pastures, while between 700 ft. and 1,500 ft. the opposite is the case; this is typical of much hill country.

As is the case with every hill district, farms are lapsing from use. On the west side of the area (facing the prevailing Atlantic winds) there are about ninety farms, of which some twenty (almost all 'hill' farms) have been abandoned, and the land has been taken over by some other (generally a lowland) farm; it is this more than anything else that has led to the extensive areas under bracken and gorse below 700 ft. On the east (and sheltered) side of Plynlymon the cultivated land and the bracken run up to considerably higher elevations than on the west, and only comparatively few (perhaps 4-6) farms have gone out of cultivation; but, in the vicinity of former lead mines, many isolated fields, and some houses, have been abandoned.

The Central Wales Massif. A great block of country which is a continuation of that just described: a considerable proportion of the land is above 1,500 ft. In the main it is good sheep country; there are steep slopes, but also a great deal of tractable land. Here occur some of the largest sweeps of relatively pure *Molinia* pasture in the whole of Britain; for the most part the pastures are on soil not unduly retentive of moisture, and on undulating tractable ground. I consider that this block affords immense scope for improvement, but a well-planned system of shelter belts I should regard as being of the first necessity.

The Radnorshire Mountains. These include the Radnor Forest and contiguous blocks of high land. There is here a considerable proportion of land above 1,500 ft., but the gradients are usually easy and tractable. Between Rhayader and Newtown there are extensive tracts of highly improvable *Molinia* pasture, while to the east and running up to the Kerry Hills there are considerable areas of clean *Nardus* and fescue pastures which carry large flocks of sheep. In this area the plough line goes up to quite 1,200 ft. and sometimes to over 1,300 ft. A significant feature of the area is the development of shelter belts—usually quite narrow strips of coniferous woods—and these have contributed in

TYPICAL AREAS IN WALES

large part to the fact that stock is regularly wintered here well above the normal rigour-of-winter-climate line for Wales. At lower elevations bracken is common, much of it on easy slopes, and this is particularly true of Radnorshire as a whole. Heather occurs on hill cappings above 1,500 ft., and occupies considerable areas in the aggregate. The hill land of Radnorshire offers wide scope for the grassland improver.

The Eppynt. This is in the main easy, undulating country, and it nearly all lies between 700 ft. and 1,500 ft. *Nardus* and *Molinia* occupy by far the larger area. Where fescue pastures occur they are being understocked, with the consequence that bracken and heather are gaining ground rapidly.

Brecknock Beacons. There are considerable areas on the Beacons that are too steep for mechanical treatment. Of the total acreage (47,000 acres) some 47 per cent. lies above 1,500 ft., and a similar acreage lies between 700 ft. and 1,500 ft. An area of about 5,000 acres in mixed grass—*Nardus*, fescue and *Molinia*—between the valleys of the Taf Fawr and Taf Fechan would, however, lend itself admirably to improvement. Considerable acreages are used as catchment areas in connection with large urban water schemes, and many of these are situated on easily tractable land.

Fforest Fawr and Carmarthen Van. These include an area of about 127,000 acres giving 21 per cent. of land above 1,500 ft., and 76 per cent. between 700 ft. and 1,500 ft. The main plateau consists predominantly of *Nardus* and *Molinia* on gently undulating slopes, and there is here ample opportunity for improvement. The farmlands reach to about 900 ft., and enclosed (or partially enclosed) *ffridd* to 1,100 ft., but the plough line does not now exceed 900 ft. in this district.

The Industrial Area. Most of the rough grazings in the immediate vicinity of the industrial areas of South Wales (the tongues running between the mining villages) are below 1,500 ft., but out of a total area of about 200,000 acres, 22,000 are above the 1,500 ft. contour line. About 25 per cent. is either too steep for mechanical treatment or is covered by refuse heaps. Much of the steep land is fern-clad, and a good deal of it in the past has been wooded. There is a large amount of *Nardus* pasture, often exceptionally pure; *Molinia* is abundant on the flat tops. Some

of these hills are held in common; on others the urban communities have park rights, and there has been much haphazard and indiscriminate burning. On areas so burned, associations consisting of crowberry (*Empetrum nigrum*), bilberry, stunted heather and *Nardus* are abundant, and often cover large areas.¹ These associations betoken hungry soil conditions, and fertility has undoubtedly been dissipated by the continual burning. The improvement of these areas presents difficult but by no means insuperable problems, and their proximity to the mining centres—now so unhappily depressed—makes them important from this point of view.

The striking feature of the rough grazings in South Wales (south of the Dovey) is the great predominance of *Nardus* and *Molinia*. Of course a fair proportion of the *Molinia* tends to occur on land with impeded drainage, when it will have associated with it *Scirpus* or rush, while the *Nardus* often tends in the direction of heather or bilberry, which render cultivation less easy. The fact remains, however, that there is an enormous acreage in the aggregate of clean *Nardus* and *Molinia* pasture capable of comparatively easy and immediate improvement. For example, Mr. William Davies has estimated that in the case of about 500,000 acres south of Builth as much as 86 per cent. (excluding cultivated land) is *Molinia-Nardus*-clad. If attention is confined to the land between 700 ft. and 1,500 ft., and thinking only in terms of exceedingly easy gradients, there would be quite 120,000 acres of *Molinia-Nardus* within this area that could be taken in hand with very little difficulty. Between Builth and Machynlleth there would be not less than a further 70,000 acres of tractable and relatively pure *Molinia-Nardus* land. This, together with the large acreage in bracken, gives some idea of the scope that exists for the improvement of the hill lands of Central and South Wales. In Wales the total area at all elevations under *Molinia-Nardus* is of the order of 1½ million acres; the area under heather is approximately 130,000 acres, and that under bracken about 152,000 acres, while there are about 12,000 acres under gorse.

Taking the hill lands of Britain as a whole, the three great

¹Similar associations occur in Scotland and on the N.E. Yorkshire moors, following too frequent heather burning.

vegetational units which invite the most easy reclamation are the cleaner of these *Molinia-Nardus* pastures, the more gentle of the bracken slopes, and the heather moors. These three units, moreover, occupy the preponderant acreage of hill land. Taking England and Wales, and despite the moors of the N. of England (on some of which heather predominates), the *Molinia-Nardus* pastures undoubtedly occupy the largest area; in Scotland, perhaps the moorland and non-gramineous vegetation does so, and in any event such moors contribute in generous measure to the hill lands of Britain as a whole.

The heather moors present a difficult and special problem, not only on account of their association with grouse and deer, but because for sheep, equally with game, they demand highly skilled management. Heather, unlike most of the plants colonizing hill land, produces an abundance of seed—seed which is capable of lying dormant in the soil for considerable periods ready to colonize the ground if conditions become suitable. A large proportion of the *Nardus* pastures are potential heather moors, a large proportion of the heather moors potential *Nardus* pasture. Excessive burning, followed by too hard grazing, will always shift heather in the direction of *Nardus*—pronounced understocking of *Nardus* is likely to initiate a movement in the direction of heather. On the other hand, *Nardus* pastures can readily be improved in the direction of *Agrostis*-white clover pastures. The trouble with a very considerable proportion of our heather moors is that the management is not good. The burning is still frequently on too long a rotation and the shepherding inadequate, and therefore large areas are in transitional phases of vegetation of little value to game or to sheep.¹

On the fells heather provides sufficient keep for in-lamb ewes in winter, and a good fell is always regarded as one preponderantly in heather. It is true, however, that on the best fells there is always some good grass, if only comparatively little, to be found along the banks of brooks and the sheep tracks. In

¹The burning of heather in small patches on grouse moors has undoubtedly resulted in underestimates of the acreage burned, with the consequence that nothing like one-twentieth of the total area is burned each year. The patch method of burning is liable also to lead to overstocking (by sheep) on the areas burned.

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general, the alternatives on the fells under present systems of management are heather or poor grass (predominantly *Nardus*) and naturally the sheep farmer prefers heather—and the more so because heather has a definite value for wintering.¹ In my view, and for the moment still thinking wholly in terms of sheep, the amount of heather moor (and certainly of poor heather moor) is definitely excessive. Much of the enclosed farm land of the hills in the past has been won from heather moor, and it is beyond question that heather moor is capable of being turned into tolerably good grass—something much better than *Nardus* pasture.

I have never been able to unravel the position as to the compatibility, or otherwise, of grouse and sheep—it seems to depend to a very great extent on the local circumstances. I should certainly not wish to interfere with the sportsman for the sake of interfering with him, but he must be reminded that deer forests and grouse moors run into millions of acres, and it is certain that interference on a grand scale is bound to come, and when it comes, and I think quite rightly, concerted action will be taken rather on behalf of the urban population than of sheep.

In so far as land improvement is concerned, I should be in no immediate hurry to make an onslaught upon the best heather, and therefore upon the best fells or the best grouse moors at elevations above 700 ft. I should start with the *Molinia-Nardus* pastures and the transitional heather zones. I think, however, that it is difficult to justify the retention of large acreages in heather below 700 ft.—except possibly where the rigour-of-winter-climate line (for man and beast) comes down to practically sea level. Perhaps it does so in the north of Scotland!

In the improvement of hill grazings, wise selection of blocks in relation to individual walks and holdings is essential. Areas in heather, in rushes, in heath rush, in hill gorse (*Ulex Gallii*) and the like must always be left within reach of the sheep. In times

¹The normal practice of fell farming is to maintain the ewe flock on the fell the whole year, except for actual lambing, when the ewes are brought down to the intake for 3-4 weeks in April. The lambs are also weaned on the intakes in August, the wether lambs then being sold off. The ewe lambs return to the fell until the middle of October, when they are sent to the lowlands for wintering until April, or exceptionally—if the intake is large and well cared for—they are wintered at home.

LAND TENURE

of snow such vegetation, because coarse and long, is likely to protrude through the snow where heavily grazed improved swards would not do so, and on this account a certain proportion of rough vegetation is always valuable.

The question of land tenure is of special significance in connection with the improvement of rough and hill grazings. In England and Wales it is now estimated, with some degree of accuracy, that 1,200,000 acres of the total 5,000,000-odd acres are grazed in common as distinct from those in sole occupation.

The area of commonable land in Wales is probably about 500,000 acres. Most of the common land in England and Wales is in those counties that have large areas in rough and hill grazings, and much of such common land is at relatively high elevations. Large acreages of common land are met with in the following counties:

Cumberland	-	-	-	-	-	104,730 acres.
Yorkshire (N.R.)	-	-	-	-	-	175,705 „
Yorkshire (W.R.)	-	-	-	-	-	134,553 „
Devon	-	-	-	-	-	160,101 „
Brecon	-	-	-	-	-	142,101 „
Montgomery	-	-	-	-	-	107,736 „
Radnor	-	-	-	-	-	66,537 „

The common land in many of the above counties contributes more than 50 per cent. to the total of rough grazings. Lancashire, Westmorland, Durham, Northumberland and Shropshire also have relatively large acreages in common.

A very considerable proportion of the commonable rough and hill grazings are eminently improvable; this is particularly true of the Eppynt and other areas in Breconshire. In Radnorshire many of the commons are now completely overrun with bracken. There are, for example, two large areas of almost pure bracken in the Newchurch district standing at about the 1,000 ft. contour, each of about 500 acres on easy gradients, practically all of which could be easily converted into very useful grazing land.

It is, however, nobody's business to initiate and pay for the improvements. Commoners are jealous of their privileges, and although an improved common would be greatly to the advantage of all having grazing rights, one cannot conceive of the commoners uniting together and deciding to finance an undertaking for their mutual benefit.

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More than this, the Common, Open Spaces and Footpaths Preservation Society is deeply interested in preserving the commons for the recreation of all and sundry—I am no less interested. I argue all along—and I have had innumerable arguments with friends who love hill country as much as I do—that the sort of improvements which I envisage would not in any way detract from the amenity value of the areas so improved. In fact, the opposite would be the case: the improved grass would only heighten the contrast between the various shades and tones of vegetation proper to such country. Nobody, as far as I know, and least of all I myself, would advocate the radical improvement of all our hill grazings, and it is only exceptionally that great blocks of country extending to thousands of acres could usefully be taken in hand *in toto* and as one unit.

The acreage involved, however, is in the aggregate large, and it is therefore very important to emphasize the fact that common land is not predestined to be waste—it can be improved. The same is, of course, true of a considerable amount of land held by the National Trust, and I wonder what the views of the Trust would be if, for example, the grazing tenant (if such there be) on the Holnicote Estate (between 6,000 and 7,000 acres of moorland and wood on Exmoor) came forward and said he desired to tractor up and improve say 300 acres of moorland.

Very large acreages of rough grazings are held by municipalities as catchment areas for their reservoirs. This has led to a considerable amount of afforestation at the relatively lower elevations. The land at the higher elevations continues to carry sheep, and much of such land is improvable. This is true of an appreciable proportion of the country appertaining to the Birmingham Water Works behind Rhayader. More and more land is bound to be taken on behalf of the cities for the provision of water. When contemplating such expensive works as the making of vast reservoirs, it is hardly to be expected that those concerned in the selection of catchment areas would be affected one way or the other by the relative improvability for grazing of one possible terrain compared with another. The matter, however, is, perhaps, worthy of consideration in view of the fact that the area from which to select is large and the alternatives probably numerous. The land recently taken by Swansea at the

head of the Usk, for a scheme which apparently is not immediately to be proceeded with, contains a large acreage below the 1,500 ft. contour in easy gradients that is particularly well suited for improvement. Possibly land improvement and the provision of water could be made compatible. If the two activities could be conducted concurrently by the same authority, then so much more labour could be brought into the district and usefully employed in one comprehensive act of organization.

Although the great bulk of the rough grazings is part and parcel of our hill and mountain land, yet in the aggregate there is a large acreage which occurs as outliers, each of which may not occupy more than a few hundred acres.

These outliers present special problems. They are often isolated from the main 'mountains' and they lie nearer to habitations, and are liable to be frequently and indiscriminately burned over. The vegetation usually consists in large measure of stunted heather, *Vaccinium* and *Nardus*—the grazing value is of the slightest; indeed many such areas are put to very little use. They are not good enough, or large enough, to constitute grouse moor. Devon and Cornwall have large quantities of rough grazings of this type, such as Hatherleigh and Beaford Moors. In Wales there is much rough grazing on the Lleyrn Peninsula, and considerable areas occur in south Cardiganshire, Carmarthen and north Pembroke. Practically all this outlying country is below 1,000 ft., and a great deal of it below 700 ft. A considerable proportion is, however, commonable: thus

‘I John of Gaunt
Do give and do grant
Hatherleigh Moor¹
To Hatherleigh poor
For ever more’.

Save for common rights, where they exist, I should be definitely in favour of afforesting a large proportion of this type of country, because to do so would not have any appreciable unbalancing effects. On the other hand, the gradients are gentle, and good grazing lands could be made over a large proportion

¹Hatherleigh moor is, I believe, in fact, privately owned—the tenants of particular farms having grazing rights on the moor.

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of these 'outliers', when they could often provide good wintering for mountain ewes.

There is a further type of rough grazing worth mentioning, namely, the gorse-bracken-blackberry-heather lands that are common on cliff tops and hillsides facing the sea. There are thousands of acres of such land along the coasts of Cardigan-shire, Pembrokeshire, Devon and Cornwall, much of it fairly flat and definitely improvable, some of it on slopes too hilly or too rocky to be tackled lightly. In the generality of cases these lands are infested by rabbits, indeed the wholesale elimination of rabbits is an essential pre-requisite to an organized campaign of land reclamation. Gorse, like bracken, is gaining rapidly on many areas, including those near the sea, that not many years ago were comparatively clear and properly fenced.

In these chapters, on the land, and writing as a self-appointed advocate of the land, and as far as my own knowledge permits, I have drawn up the indictment. I am not deeply concerned with the defence: I am more concerned to show in the immediately succeeding chapters that on technical grounds improvement is easy and by no means necessarily expensive. The jury—the nation at large—in the last resort must decide. The defence (in short, my critics) is well armed with evidence and arguments both awe-inspiring and subtle. I shall be told, for example, that all is well with our farming because our output per man is almost unchallenged. The easiest method of increasing output per man is, of course, to concentrate increasingly on good land, and on the better parts of the farm. The whole process carried to its logical conclusion would resolve itself into a *reductio ad absurdum*. One farmer left in England, and he on the very best land! In the last decades we have been moving faster towards this 'ideal' than I should imagine even its most strenuous advocates quite realize. I shall lightly touch on further arguments for the defence in subsequent chapters.

CHAPTER IX

Resources: Technique

Point of view. Grass should precede arable. Modern facilities. The place of the legume. Rye-grass-white clover the ultimate aim. The plant breeder; leaf, persistence and mineral-efficiency. The value of miscellaneous herbs. The removal of roughage. Cultivation and the tractor. The special problems of hill land. A sequence of long leys. Rough grazings; the creation of improved patches. Over- and under-grazing. Lessons from Switzerland. The use of pigs and poultry.

It is not only increasing knowledge but also changes in point of view which lead perhaps to the most far-reaching advances in technique. A change in point of view is comparable with a mutation—it happens suddenly, with consequences of profound significance. It is like the bursting of a dam, but instead of water it is knowledge and facilities that suddenly take shape and flood the world with new possibilities for good or for evil. So it is with land improvement in its widest sense, point of view has shifted entirely.

In a word, the older idea of land reclamation was to create arable and grow crops as the first stage, and later perhaps to put down to grass. Witness, for example, the heroic strivings of the Knight family on Exmoor, and the more immediately successful endeavours of men like Coke of Norfolk. The reverse process has, however, been extensively adopted in the new countries, and over large areas in New Zealand the direct conversion of bush to grass has preceded arable farming and crop production. Even where grass *qua* grass is concerned, the view has been tenaciously held in this country that it is only possible to make good grass after a preliminary period in arable. The reverse is, however, probably the truer dictum—to make good arable, first make good grass.

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Enormous advances have taken place in knowledge and facilities since the days of the older pioneers. The shift in point of view has not only been in placing grass before arable in the process of land reclamation, but also in the direction of placing clover before grass in the technique of sward creation and sward improvement. The four-course rotation is always regarded as being pivoted on the turnip, but yet assuredly it has been the red clover and the clover root that in truth deserves most of the credit, and which since the days of Townshend has done far more for arable England than can in fairness be ascribed to the introduction of turnip and swede. The corner-stone in land improvement in all parts of the world is the leguminous plant. Let it once be possible to establish a swarding and edible leguminous herb and it becomes easy to create a tolerably good sward—a sward with a definite stock-carrying capacity. A good sward is generally convertible into reasonably good arable. The point immediately at issue is, that wherever the appropriate legume can be established, just there is it possible to effect startling grassland improvement, and grassland improvement can be either an end in itself (a sufficient act of reclamation) or a first step towards arable. In Great Britain there is no question as to what is the appropriate legume for the land improver. It is not red clover, but wild white clover, a plant that, thanks primarily to the late Sir William Somerville, has already done so much for thousands of acres of the poorer grasslands of the country. We are, however, only on the threshold of what can be done through the intermediary of wild white clover. Our technique in grassland improvement (and therefore in land reclamation) to a very large extent must be made to revolve as it were around wild white clover.

In this chapter I shall endeavour only to lay down the bed-rock principles of grassland improvement considered as an integral part of land improvement. The details will be discussed in subsequent chapters, when the financial aspects of the different methods will be brought under review.

First then the legume, because on account of its association with the nodule organism it is able to enrich the soil and give enhanced fertility—a fertility which reacts on the grasses growing with it, and not only increases the productivity of the grasses but

THE PLACE OF THE LEGUME

makes for conditions progressively better suited to the better grasses.

The grasses taken as a whole and considered in terms of the final attainment of the land improver are probably of greater value than the clover: they are more productive under constant grazing, and they afford a longer grazing season, but the clover is the first step. The clover is, however, always valuable on its own account, for it is richer in calcium than the grasses, and, taking the grazing season through, it is richer also in protein.

The high calcium content of clover is very important in connection with improving the derelict grasslands, for such grasslands are generally markedly mineral-deficient, while on the poorest soils, until the fertility has been much enhanced, the clover will often actually yield more abundantly than the grass.

As I have shown in my chapter on vegetation, the ideal to be aimed at is always a rye-grass pasture; and to endeavour by gradual stages to work up to this ideal must constitute the working plan of the land improver. He will need the assistance of a number of grasses to suit the many conditions to be dealt with, and to carry him through the various stages. Technique has altered, greatly to the land improver's advantage, in respect of grasses, for the plant breeder has come to his aid. To-day it is less a matter of what species of grass to use than of what particular variety or strain of the comparatively few really suitable species to select.

Persistency, durability, and an ability to withstand relatively adverse conditions constitute the first necessity. The second necessity is sustained productivity. High nutritive value is of little account without durability and productivity. Just as wild white clover is the persistent and durable clover, so are the grasses that are derived from 'wild' sources the most durable. Coke of Norfolk realized this, for 'he gave his simple botanical lessons to the children of his tenantry, who scoured the country to procure his stocks of seed'.

The plant breeder has used chiefly the indigenous stocks in his work, and so it happens that the strains the informed land improver now employs—those leafy, persistent strains—have in the main a direct relationship with those used by the earlier pioneers.

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Leaf is what is desired, for the nutritive value of a grass resides in its leaf. The good grass is one that will produce the maximum amount of leaf over the longest possible season. There is little difference between the nutritive value of the leaf of one grass and another: the grass that suits any particular conditions is just the one that under those conditions maintains the most vigorous production of leaf. The only other characteristic that matters is the degree of palatability of the leaf, and, therefore, harshness or hairiness may detract from the value of a grass.

Of an importance ultimately equal in the scale of values to wild white clover is that of the best grass—and the best grass is the leafy, persistent perennial rye-grass: the type of rye-grass that is harvested with wild white clover from old pastures—a type which the plant breeder has now been able to improve upon.¹

In considering grassland and methods of improvement we cannot ignore the herbs, for a natural sward always consists of grasses, clovers and herbs.

We must remember that the natural function of 'grass' is to constitute a self-contained feeding stuff. It is true that at different times of the year, and for different purposes, animals on grass may be given supplementary feed, but grass alone is capable of sustaining highly productive animals, and is expected entirely unaided to sustain young and growing stock. Bulk and nutritive value are essential. Protein efficiency is assured by a good development of grass leaf and of clover. Mineral efficiency must, however, also be safeguarded. It is here that the grasses tend to be deficient, and especially upon the poorer situations. White clover is highly calcium-efficient, but is not strikingly efficient in phosphoric acid, while it makes little growth during the winter and is rather late to start in the spring.

The herbs of grassland are undoubtedly of great value in connection with providing minerals, and those which are eaten by stock must not be lightly considered merely as weeds, and especially is this so on the poorer lands where the grass herbage is sure to be minerally deficient, and the clovers perhaps only

¹The best example is perhaps the S.23, bred at the Welsh Plant Breeding Station by my colleague Dr. T. J. Jenkin, limited supplies of which are now on the market.

THE VALUE OF MISCELLANEOUS HERBS

sparsely present. My friend Professor Fagan has devoted a great deal of attention to the so-called weeds of grassland, and especially to those that are winter-green and are definitely eaten by stock. Ribgrass, daisy, cat's ear, hawkweeds and buttercups (eaten to an appreciable extent) are exceedingly rich in calcium.

Outstandingly high phosphoric acid content is unusual. In the case of the above-mentioned herbs it is, however, higher than that of nearly all the grasses. The phosphoric acid content of ribgrass is unusually high, and that of dandelion much above the average. As a dual-purpose (calcium and phosphoric acid) deficiency rectifier ribgrass perhaps takes the most important place, while the common daisy is of only little less value—both are grazed by stock, and on certain situations, particularly in the winter, both are frequently grazed hard to the ground.

The whole question of the rôle of minerals in nutrition is one of extreme importance, and we now know that very small quantities of a number of different minerals are essential to health, and there is also the question of other substances contained in the tissues of plants. It stands to reason that a wider range of ultimate chemical ingredients will be supplied by a fairly numerous flora, consisting of plants representing a number of different natural orders, than by that provided only by two natural orders—the grasses and clovers.

The point I would wish to make is that animals probably need to have access to herbs along with grasses and clovers in order to be provided with every single ingredient necessary to perfect health. The amount of such herbs present need not be large, for they are probably concerned rather with the making good of special deficiencies than in providing large bulks of any individual requisite; though on lime and phosphate deficient soils, where these deficiencies have not been rectified by manuring, they may be valuable in this connection also.

In excess, even the most valuable of mineral-efficient herbs are weeds pure and simple, because they are low in dry matter content, and under grazing do not maintain high yields, and then only take the place of the more productive grasses and clovers.

In our methods of improving grassland we cannot, however, ignore 'weeds'. Two points arise. On the poorest situations, where the soil is highly deficient in minerals of all kinds,

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manuring should be supported by sowing the seeds of herbs that are the most efficient in rendering minerals available to the animal. This is so to a marked degree on the rough and hill grazings, and there I believe it is just as important to endeavour to introduce herbs like ribgrass, daisy, the hawk-weeds and buttercups, normally completely absent, as it is to introduce white clover and the better grasses—to do so is part of the technique in improving such grazings.

On better situations and where these edible 'weeds' are normally present, it would be folly to sow them. It must be recognized, however, that it may be possible to develop a sward altogether too weed-free. Such in fact are the beautiful swards which are the end-stage of the land improver's endeavours—those consisting practically only of leafy perennial rye-grass and wild white clover. I firmly believe that such a condition (a 'weed'-free herbage) should always be guarded against, and I would do so by sowing a couple of strips across my improved field—my strips would consist of a mixed flora of edible herbs.

Thus, the technique of grassland improvement consists first of establishing wild white clover, and then the better grasses, and always so arranging matters that edible herbs are within reach of the grazing animal.

Speaking broadly, two facts have to be recognized, namely: that it is possible to establish wild white clover without any cultivation and to do so comparatively quickly, while in the case of the better grasses it is usually necessary to sow them on a more or less earthy tilth.

Where wild white clover is already present, though even in small quantity, it is well known that heavy phosphating is all that is necessary to occasion great improvement. Where there is no clover, the benefits from phosphating may often be achieved by also sowing the seeds of wild white clover, and this without any cultivation or mechanical treatment of any kind.

To start in this way is often a sound procedure, and when a good mat of clover has developed, the sward might be heavily scratched-up or ploughed and a full mixture, including the leafy perennial rye-grass, sown.

A good development of clover will, however, never be achieved unless coarse and over-topping vegetation is removed.

THE REMOVAL OF ROUGHAGE

To remove roughage is therefore in all cases the first act of the land improver. The roughage may be bracken, gorse, rushes, scrub or tall and rank grass. In the case of *Molinia* a constant mowing is the surest method of elimination, while if a cheap and effective means of mowing-over rough surfaces could be found, a difficult problem of the grazier would be solved.

Having removed roughage, the land improver has a number of alternatives before him. He may phosphate heavily and sow wild white clover, do nothing more, and wait for his results. He may support the phosphating and sowing of wild white clover by roughing-up the surface with a heavily tined implement. This will greatly expedite matters, as the roughing-up will tend to break up the mat. He may set out completely to destroy the existing vegetation and endeavour to rough-up to such an extent that he will obtain a reasonably good earthy tilth, when he will sow grasses as well as wild white clover. In these circumstances he will, in addition to the phosphates, apply a small dressing of nitro-chalk to assist the seeds to establish themselves. His final alternative is to plough up the old sod and to sow down a full seeds mixture immediately.

In all cases, and on every situation, whatever means he adopts should be regarded as the first attack only. For it is always at the second attack that the really striking benefits are produced. Thus, if he has roughed-up, a few years later he should either rough-up again or follow by ploughing—and where he has ploughed, he must a few years later plough a second time. He may begin by sowing wild white clover only, or wild white clover with the less good and cheaper grasses, but always and when improvement has been carried sufficiently far he will sow the leafy perennial rye-grass as the chief ingredient in his mixture.

Such in the fewest possible words is the philosophy of grass-land improvement, a philosophy which applies practically the whole world over. Indeed it does apply the whole world over if we generalize to this extent: 'Start with the legume appropriate to the conditions, and end with the best grass appropriate to the conditions, and make provision on each grazing enclosure for a sufficiency of strips of non-poisonous and edible mineral-efficient herbs.'

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To-day, thanks to the internal combustion engine, to specially prepared steels, and to strong implements of a great many different designs, the more appropriate of these methods can be adopted almost anywhere. In Great Britain with the aid of a Caterpillar tractor there are not many thousands of acres even of rough and hill land where it would not be possible to take phosphates and seeds, and over the larger proportion of such land it would now be possible to drag some sort of an implement.

Climate is only one limiting factor affecting the carrying capacity and nutritive value of the grazings on hill land. Equally, or even more seriously, limiting factors are depleted soil fertility and, in consequence, the wrong botanical flora, no clovers, the wrong grasses and the wrong herbs. Climate we cannot alter, but modern technique, by countering soil depletion and an inappropriate flora, makes it possible to look upon the problem of our rough and hill grazings in an entirely new light.

A little more must be said relative to the particular problems of these lands, as they are of a special importance in view of the large acreage involved. There are two distinct issues at stake—the question of wintering, and that of the general health of the animals. In many districts the hill farmer may spend more than his rent in wintering a large proportion of his ewes in the lowlands. He is also frequently faced with the problem that he is unable to fatten wethers or lambs on his hill land. To increase his capacity for wintering and to be enabled to fatten some proportion of his lambs on his own land would be of great benefit to the hill farmer. For these purposes he needs to concentrate attention on the lower of his lands, land not much above the 1,100 ft. contour. In the first instance it is his 'intake' and farm land that urgently calls for improvement, and wherever possible I regard it as of supreme importance to increase the size of the intake. In the case of many, and perhaps of most, hill farms that have associated with them a considerable acreage of open hill country, it would be possible to increase the size of the intake to an extent of 10 to 20 per cent.

The endeavour should be to develop a sequence of high-class long-duration leys taken over the whole intake. On most hill farms the grass of the intaken fields is extraordinarily bad and

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is completely overrun with herbs, consequently these amount to no more than weeds. Good long-duration leys would improve the quality and quantity of both summer and winter feed for stock. In addition, a certain amount of hardy green turnips and Italian rye-grass would provide supplementary fattening crops as well as making for additional provision for wintering. In this connection it must be remembered that with modern facilities it would be far easier for the farmer of to-day to enlarge his intake and to make first-class grass as he proceeds, than it was for the pioneer of some generations ago to make his fields and his swards, though the latter naturally selected the best, or at least the easiest ground for his—the original—intake.

In many districts, and especially in the North of England, the intakes are not farmed at all—hay is taken year after year from the maximum area. The hay is of poor quality, and can but seldom be harvested under even reasonably good weather conditions. I believe that it would be much to the interest of such hill farmers to rely more on oats, which on the balance are easier to harvest, at least in moderate condition, than is hay. To discuss in detail the problems of the management of the intake would take me too far, and to do so is beyond the scope of my book. I would, however, most strongly insist that unless the potentialities of the intake are fully realized, it is idle to embark on a scheme of improvement on the open hill.

The chief aim in improving the open hill should be to give the sheep access to mineral- and protein-efficient herbage. Such herbage should react favourably upon the health of the flocks, improve the quality and quantity of the milk of the ewes, and therefore make for stronger lambs capable of quicker growth. On every sheep-walk it should be possible to create large patches or strips of efficient herbage. The aggregate acreage of such patches would, of course, be determined largely by the character of the country, but should probably be not less than 5 per cent. of the total walk. They could be gradually extended, and in some instances it would be possible comparatively easily to improve quite 60 per cent. of the whole walk.

The land selected for initial improvement should never be in one piece, but should always be carefully arranged in a number of beats, some on one aspect, some on another. Sheep are very

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sensitive to weather conditions and move from place to place as much for shelter as for food, so that every shelter should have its area of efficient grass. Improvement of hill grazings on these lines demands not only local knowledge in the selection of the areas to be dealt with, but also good shepherding.

As a matter of fact all sheep-walks are an aggregate of patches—some good, some bad. The proportion of a large walk that affords substantial grazing to the flocks is very limited, far more limited I am sure than anybody realizes.

Man often accidentally contributes to the making of super-patches. This can be seen to perfection alongside roads, especially when the road material has been limestone, but provided the material is not shale and gives rise to a gritty dust, the road-maker contributes (or to be more exact has contributed in the past) in a very important way to the production of super-patches. With the advent of the motor car the roads are tar-sealed. This is unfortunate for the sheep, for there is no longer a regular top dressing of the herbage on both sides of dust-swept roads. But the legacy of such top dressings is there for all to see, and will long remain—the sheep themselves will attend to that.

During last summer I motored from Cambo to Jedburgh, and from Brough to Reeth. Again and again on both roads nearly all the sheep in sight were congregated within about 40 yards of each side of the road.

The dust (of earlier years) combined with the excessive grazing had gradually created a perfect little sward completely free from mat grass and flying bent close to the road for 4 or 5 yards, and then meandering here and there between clumps of the natural and totally neglected vegetation to a distance of quite 40 yards from the road. On the Brough-Reeth road, at well above 1,300 ft., the flora consisted of an abundance of wild white clover, daisies, ribgrass, buttercups, hawkweeds, self-heal, with bent, *Poa annua*, Yorkshire fog, sheep's fescue and sedges. The herbage was uniformly grazed to ground level, and was, therefore, protein-efficient; the botanical composition also proclaiming its higher mineral-efficiency. So much for accidental causes and the subconscious sagacity of sheep.

My attention was first drawn to this phenomenon as long ago as 1913 when engaged upon making an ecological survey of a



Sheep making their own pasture
alongside a mountain road



Cahn Hill Improvement Scheme:
burning roughage

CREATION OF IMPROVED PATCHES

large area of hill country in Wales. Wherever one met with plots which had been gardens of old mining cottages, there inevitably were to be found super-patches.

It was, however, only when in 1931 I made my own super-patch, a strip nearly one mile long running through a sheep-walk, that I realized to the full all that was implied. The protective cages we put down at intervals along the patch in question revealed the full extent to which the sheep regaled themselves off the efficient herbage provided, and emphasised the contempt in which the natural vegetation was held.

An important and interesting fact in connection with the making of patches is the ability of the sown grasses, clovers and herbs to establish themselves even when entirely unprotected (by fences) from the attention of the grazing animal.

My theory, and the picture I have drawn, are open to a serious theoretical criticism, namely, that the congestion upon super-patches would intensify the dangers from intestinal and other infections. To this I would answer firstly, that there is such congestion on almost every sheep-walk at present, and by enlarging and extending the areas for natural congregation the risks, real or supposed, would be lessened and not increased. Secondly, I should expect that sheep, given the opportunity of easily acquiring a reasonable sufficiency of protein and minerals, would be less liable to suffer from the effects of the various and sundry infections than those denied such a ration, and those that, therefore, had to walk excessive distances or devour vast quantities of fibre in the twenty-four hours in order also to obtain essential nourishment.

On the better classes of hill land, and on the easier slopes, large areas of upwards of 50 or 100 acres could often be improved *in toto*. When improvement on this scale is undertaken, the areas so improved should, however, be fenced off into paddocks so that the grazing could be controlled.

In some hill districts it would be feasible radically to improve very large areas, when it would be desirable to set up additional homesteads and to reduce the size of the present holdings. This is a matter, however, that would demand very careful consideration, the greatest difficulty being to choose sufficiently good and sufficiently sheltered positions for the new intakes and home-

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steads. I will revert to this aspect of the question when discussing rural population.

The belief that a great deal of our hill grazings could be improved out of all recognition is undoubtedly reinforced by what has been accomplished in Switzerland. When Mr. William Davies on my behalf attended the Third International Grassland Congress in July 1934, he had an opportunity of acquainting himself at first hand with conditions in Switzerland, and with the researches that have been undertaken. In the closing paragraphs of a report prepared for the Ministry of Agriculture he sums up the evidence from Switzerland in relation to our hill pastures as follows:

'A study of alpine pasture management can be extremely valuable to us in Britain, particularly in view of the current researches into the improvement of hill grazings being conducted at Aberystwyth. In this connection a synopsis of observations made on the Rigi pastures (6,000 ft. elevation) is instructive. On the property of Messrs. Burgi Bros. of Rigi a number of pasture associations was noted. These represent successive phases of development from *Nardus stricta* dominant with *Calluna vulgaris* to *Poa* dominant with white clover and even traces of rye-grass. There are a sufficient number of "relict" communities which are *Nardus* dominant to indicate the essential characteristic of the natural association. The following statement will show the various grassland association types to be met with under alpine conditions, listed in relation to economic improvement and grazing value:

'*Natural association:* *Nardus* dominant, with *Calluna*, *Juniperus*, *Lotus* and fine-leaved fescue.

'*Improved associations:*

1st stage.—Decreased amount of *Nardus* and *Calluna*, *Juniperus* absent. Marked increase in *Lotus*. Ingress of *Trifolium* (both red and white clovers).

2nd stage.—*Trifolium* co-dominant with mixed herbage (=weeds). Increased proportion of fine-leaved fescue. Ingress of *Agrostis* with traces of *Poa*, *Lolium* and *Phleum*. *Nardus* and *Calluna* negligible.

3rd stage.—*Agrostis* and white clover co-dominant. Much fine-leaved fescue and *Poa*. Dense sward of palatable herbage.

4th stage.—*Poa* dominant with sub-dominant white clover. Other species in minority and include red clover, rye-grass, timothy

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and *Aira caespitosa*. Dense turf of high grazing value. (No *Nardus*; no *Calluna*; no *Juniper*—complete replacement of the natural association.)

'This gradation is interesting in relation to our hill work at Aberystwyth, and emphasizes the possibilities of that work. Switzerland has found it economic to build up her pastoral lands at elevations of 6,000 ft. from the *Nardus* dominant to a valuable *Poa* dominant formation. It is not too much to hope that we can do likewise in Britain at elevations below 2,000 feet. A review of the Swiss pastures shows very definitely that improvement in the botanical composition of the pastures, and particularly the suppression of the worthless *Nardus*, does not come about until an efficient body of legumes has been incorporated into the sward. The impetus to improvement is obtained as soon as the legumes, and especially white clover, gain a real place in the as yet unimproved sward. The presence of a highly palatable clover in a pasture otherwise composed of plants of low relative palatability makes the whole more readily sought after. The grazing animal is drawn more and more to the gradually improving sward, and incidentally thereby promotes conditions still more conducive to the growth and spread of clover. The rate of improvement is accelerated, there is more feed produced which the grazing animal consumes. More is excreted by the animal and the general level of soil fertility is enhanced. Conditions are made suitable for the spread of the better grasses as the proportions of *Nardus* and other elements tolerating low fertility are decreased.

'A similar gradation of grassland types is to be seen on our Welsh hills. We find grades from *Nardus* dominant to *Molinia* dominant, we have our fescue-*Agrostis* pastures and our areas of *Agrostis*-white clover. The latter characteristically occupy those patches which have been under the plough within the last fifty years and have been open to the grazing animal ever since. A study of high-elevation pastures in Switzerland strengthens very greatly the belief that pasture improvement is an economic possibility at very high elevations in Britain. If the Swiss can maintain high-class summer pasturage at elevations of 6,000-8,000 ft. there is no reason why we should not envisage the improvement of our very highest mountains.

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'It may be true that the Alps carry a much less acid soil type than do our mountain pastures, and possibly there is less tendency towards the formation of mat under Swiss conditions. The Aberystwyth experiments are showing, however, that considerable improvements can be brought about fairly rapidly even under our normally acid conditions, whereas the formation of mat is probably more closely connected with lack of proper grazing. There is reason to suppose that given the abundant spread of legumes in order to set going the first phases of grassland change then pasture improvement on our poorest soil types becomes possible. The Swiss experience points to the conclusion that the improvement of mountain grazings should be highly economic and greatly to the national advantage.'

There remains a further method of technique that can be usefully employed in the improvement of derelict land—the massing of animals in a regularized manner on limited areas at a time. The methods adopted by Mr. Hosier in Wiltshire with cattle and poultry afford good examples, while pigs can be used to great advantage to destroy roughage of all kinds (bracken and even small scrub) and to rough-up the surface. I know of no more striking instance of the excellent work of pigs as land improvers than that afforded by the exceedingly instructive and successful reclamation undertaken by Mr. Lloyd George at Churt.

I have here been concerned only with methods of improvement based on a direct attack upon the existing vegetation; what little I shall have to say about reclamations that demand engineering feats will form the subject of a short subsequent chapter.

Unfortunately, the underlying thesis which animates these pages can only be unfolded by a process of repetitions, extending, however, in an ever-widening circle. For example, I now have to examine the various details of technique in relation to cost, and later the evidence will have to be considered with reference to certain concrete proposals that I shall make. Because land improvement is a source of inspiration to those who indulge in it, and are interested in it, perhaps I am entitled to beg of the reader to endeavour to be patient with irritating repetitions and aggravating postponements.

CHAPTER X

Ethical and Financial Aspects of Land Improvement

Our duty to the land. The ethical standards and aesthetic values of agriculture. The changing economic position. The duration of improvements. Methods of improvement. Does it pay to manure? Intensive grazing. Lime and transport. Does it pay to sow wild white clover? Experiments in Wales. Does it pay to use a sensible seeds mixture? Experiments in Wales; live weight increase. Does it pay to maintain land in high-class temporary grass?

Does it pay? Can it be made to pay? In all connections this is the question on everybody's lips to-day. Economics run riot! and economics has taken a firmer hold on matters agricultural than ever before—but, can economics alone be the salvation of agriculture and of the country-side? I think not. There is more to the land and farming than the extraneous advantages to be gained from a substantial balance at the bank. The land itself in its kindly responsiveness to patient and careful nursing holds rewards and treasures that cannot be purchased with gold, or estimated by the most perfect and elaborate of cost accounts.

In bad times as in good there are ways and means of paying tribute to the land, and there is always happiness in the daily round and daily toil for the man who in his very marrow feels he owes a duty to the land—even as he owes a duty to himself. This sense of intimacy with, and responsibility for, the land to-day is more keenly felt, I am sure, by the generality of our farm hands than by the generality of our farmers—by men who take an infinite pride in a tidy job. To accomplish a tidy job is an act of artistic creativeness, and therefore an end in itself—with its own reward. To-day the man who does a tidy job is perhaps more likely to be counted slow than to earn extra money, while

ETHICAL AND FINANCIAL ASPECTS

the slovenly farmer may be a better reckoner than his land-conscious and land-loving neighbour—a better, a more astute, business man and harder to drive a bargain, and therefore of the two men the less encumbered.

Farming, perhaps to a greater extent even than the pursuit of science, or of religion, as a livelihood, is a mode of life, and a mode of life with its own very definite ethical standards, rigid standards perhaps, but, because deeply rooted in the soil and in the past, not lightly to be set aside. Agriculture is an art, and because an ancient art it is one with its own and very special aesthetic values—values not easy fully to understand, and only gradually to be learned and appreciated. Modern farming, like modern and organized religion, has its business side, but like religion it cannot be treated solely and only as a business.

I am convinced, therefore, that never can we with impunity neglect the ethical standards and aesthetic values of agriculture. That we are in grave risk of doing so cannot, I think, be doubted, for we are trying to keep up with the furious pace set by science chiefly or almost entirely by goading on the economist to ever greater endeavours. The economist, perhaps more devoutly than the scientist, worships at a single shrine, and in evolving business methods for the farmer is of all people the most unlikely to equate the advances of science also in terms of the ethical standards and aesthetic values born of the ages and of the land.

Land improvement most assuredly, then, is not only to be measured in cash returns, nor is the hope of ultimate gain by any means the only incentive to the breaking-in of new acres. Examples of this are still not infrequently to be met with, and in the most unexpected places, for it is surprising what inclination can lead to even without money. I know of many instances of the small farmer with not a penny to spare and nothing behind him reclaiming fields from bracken, scrub or marsh by sheer hard toil—doing what men of greater substance would not cause to be done, although not necessarily involving great expense.

Recognition and praise are active stimulants to all forms of artistic endeavour, and tend, if genuine, to encourage the craftsman and the artist alike to extend the scope of their activities, and it is so with land improvement—an art which has come to

THE CHANGING ECONOMIC POSITION

receive small praise and no encouragement. In short, land improvement is out of fashion. There are landlords, yeomen and tenant farmers within my own circle of friends and acquaintances who, despite the bad times, could afford, if only in a comparatively small way, to reclaim and improve land for the unadulterated pleasure of doing so, but they do not realize that treasures in spheres they have never explored lie buried at their very doors.

The financial aspect of land improvement must always, however, exercise a decisive influence alike on the enthusiast and on the man who awaits the almost certain promise of financial reward.

In these days of frozen assets it requires not only a long purse but enthusiasm carried to the point of daring to lock money up in the land for an indefinite, or at the best for an uncertain, period of time. The burning question that arises in connection with every act of land improvement is, therefore, how long must elapse before the necessary outlay can be recovered and triumphantly written off? The improver must cut his garment according to his cloth, and begin where he can and where the prospect of speedy returns is most promising. Outlay does not, however, end with the improvements—greater fertility must be turned to account, and this demands increased stocking or heavier cropping, which necessarily involves additional expenditure almost from the commencement.

With regard to all the methods of improvement that have been discussed, it is not easy accurately to estimate the costs, while it is a matter of great difficulty to assess the returns. It is difficult enough to do both even on the basis of fixed prices for labour, manures, seeds, fuel and oil, and of steady markets for the products. When prices fluctuate from day to day, cost accounts can do no more than show tendencies, and indicate whether a particular procedure bears the stamp of practicability, and has inherent in it the possibilities of profit given anything approaching reasonable conditions.

This has to be fully appreciated, for to-day the farmer's margin of profit—if profit there be—depends perhaps less upon himself than upon the outcome of an intricate negotiation with a foreign country or with one of our own Dominions. The

economics of a procedure, or of a process, in any literal sense is purely ephemeral, for it is not only values that are subject to rapid and violent change, but the introduction of a new machine or a greatly improved model may be responsible for startling reductions in the cost of effecting a particular operation.

The comparative costs of the different operations must, however, be ascertained as accurately as possible, even if it is difficult to assess returns in terms of pounds, shillings and pence. Yields per acre and comparisons in nutritive value and live weight increase are not smiled upon by the economist of to-day as evidence. In my view, however, they constitute exceedingly valuable evidence, for they reveal potentialities which I do not admit even in times of depression are necessarily beyond the wit of the practical man, or even of the economist himself, to turn to profitable account.

The one thing that matters above all others where land improvement is concerned, and as affecting the economics of the question, is the length of time over which any improvement, great or small, will last. Duration will of course be greatly influenced by subsequent management, so that even on this score there is little room for dogmatism. Duration in my view, however, is the crucial test for State, landowner and farmer alike. An expenditure of say £5 per acre if the benefit spread over five years might just pay and write itself off, while if the improvement lasted for twenty years—with only another pound or two spent on manures during the period—it would be likely not only to pay handsomely but to have carried over also from bad times to good, and to have yielded therefore increasing rather than decreasing profits.

In this chapter I shall deal with questions connected with manures and seeds, and endeavour to show the value of the benefits that can be conferred by their proper selection and generous use. In the following chapters I shall take explicit acts of land improvement, and, as far as possible, assess costs and returns.

The most convenient way to approach the matters now to be considered will be to endeavour to answer a number of questions.

DOES IT PAY TO MANURE?

Does it pay to manure? The famous 'manuring for mutton' experiments initiated by the late Sir William Somerville have never been fully appreciated in their implications and in their bearing upon the whole question of land improvement. Although started as long ago as 1897 they serve as guides in directions that are only now beginning to be explored. I refer to lands in even poorer types of grassland, and of appreciably lower rentals, than those upon which at Cockle Park the experiments were first started.

On many of the poorer classes of land and on the lowest grades of grassland (*fescue-Nardus-Molinia* pastures) the indications are that the dressings applied should be considerably higher even than those adopted by Sir William Somerville—and that greatly increased dressings would pay for themselves. Certain proof is perhaps not yet forthcoming, although the reports issued from time to time by Mr. John Orr of Manchester go a very long way to substantiate such a belief, as do the results of experiences recently gained in Wales on poor and long-starved soils. If we were to assume—as I think the evidence available entitles us to assume—that by doubling the standard Somerville dressing on types of grassland of an appreciably lower scale of usefulness than those upon which the Cockle Park and similar experiments were conducted, we could obtain results quite as good as these, would the extra manures leave a profit?

Over twenty-one years (1897-1917) and using $1\frac{1}{2}$ tons of slag per acre in the aggregate, Sir William Somerville reported on the basis of live weight increase and money values a net gain per acre of fully £1 per annum as an average of the whole period. If to obtain the same results 3 tons of slag had been used, the net gain would have been about 16s. 6d. per acre per annum over the whole period. To have applied this amount of slag would have entailed a dressing of 10 cwt. every $3\frac{1}{2}$ years. I regard these figures as highly significant, and especially so in the light of the following considerations. A very great deal of our poorest land (permanent grass fields and rough grazings) is not vicious, it is only completely starved as the result of delivering up wool, bone and milk (ewe's milk counts equally with cow's) for generations. On the very poor lands, and on the poorest types of vegetation, it frequently happens that no great

development of white clover (and therefore no great improvement) occurs until a second phosphating; this has been very striking in the case of much of the land dealt with by Mr. Bligh. In so far as grassland is concerned, it is the top couple of inches or so of soil that chiefly matter, and in regions of high rainfall the downward carriage of phosphates, as of lime, is to be seriously reckoned with.

In considering the evidence of the Cockle Park and similar experiments I have not used data obtained from trials conducted with cattle as well as sheep; many such trials, of course, show much larger gains than where sheep only are used. Up to the present, however, I have no comparable evidence as to cattle from experiments with which I have been concerned. Of considerable importance too in this connection, and in regard to the assessment of all grassland improvement, is the question of winter grazing, but in the figures which I have quoted from Sir William Somerville's experiments no account has been taken of the gains in this respect.

If the trained human eye is any judge, and if small plots are of any value as indications, then, and in the light of the Somerville results, I think it is safe to assume that in the presence of wild white clover extravagant phosphating—say 1 ton of slag or (where suitable) its equivalent in rock phosphates applied during the first $3\frac{1}{2}$ years—on the poorest of lands will pay for itself, and as the years go on the dressing can be decreased in amount or applied at increasingly long intervals. All the evidence from the original basic slag experiments goes to show that slagging pays for itself in its stride, and that heavy initial dressings will be written off within a few years of application. We have always to remember that phosphatic manures are without considerable benefit unless white clover is present, to at least some extent, in the sward.

All methods of treatment can only be profitable if the right and proper action is taken in relation to each particular set of circumstances. Evidence is now accumulating which definitely indicates that complete manurial dressings can be used with profit in the improvement of grassland. In the case of the poorest lands complete dressings, including nitrogen if accompanied by properly controlled grazing and even in the absence of white

INTENSIVE GRAZING

clover, not only enormously increase the yield of dry matter per acre and the nutritive value of that dry matter, but also occasion lasting changes for the better in the botanical constitution of the sward. The experiments designed to test the yielding capacity of different pasture types, to which I referred in a previous chapter, are also informative relative to response to manures. The increases in dry matter due to complete manuring in the case of some of the poor pastures on which trials have been conducted amounted to over 200 per cent. in respect of certain *Agrostis* pastures and well over 300 per cent. on *Molinia-Nardus* pastures. The yields of nitrogen, lime and phosphoric acid following the application of manures have each in many instances been increased by appreciably more than 100 per cent.

Trials have not yet been conducted for a sufficient length of time on the poorest grasslands for the necessary data to have accumulated to permit of the translation of these results (complete manuring only) in terms of money. The magnitude of benefit in both bulk and nutritive value is, however, so great and fertilizers to-day are so cheap that it is hardly credible that methods of management cannot be devised to turn them to profitable account.

That intensive grazing, accompanied by a judicious flexibility in management and in the use of manures, can be made highly profitable is now an established fact. In the present connection chief emphasis should be laid on the enormous improvements in the sward that can be fostered by sensible manuring and controlled methods of grazing.

The question whether the use of lime is profitable in connection with grassland in these present days has become a matter of controversy. I doubt if it will ever be possible to decide this elementary and extraordinarily important question by controlled experiments and elaborate cost accounts. The benefits of lime are both subtle and long-continued. Everybody who has worked at grassland and who understands grassland knows for a certainty that lime properly applied in the right way and in adequate amount (where pronounced lime deficiency exists) increases palatability, lengthens the grazing season, increases winter keep and maintains productivity during periods of stress—through times of drought, for example. More

than this, it encourages white clover and makes conditions favourable to the all-important nitrogen-nodule organism, and I have more than a strong suspicion that it also encourages perennial rye-grass. I take my stand definitely on the side of lime, and I can hardly help doing so, for as I write these words I have only to look out of my study window to be intrigued by a field which still shows the benefits of lime though applied twenty years ago, and all over Wales I encounter similar cases. When we consider the heavy drain on calcium that the continued use of pastures for milk production entails, and the importance of minerals in milk for human consumption, it must be obvious that lime is essential for such pastures. This view is strongly supported by the fact that a very large proportion of the cow pastures of the country have a poor white clover (calcium-efficient plant) content.

Does it pay to sow wild white clover? This is a crucial question, for of what avail are phosphates without the presence of wild white clover? At the outset I must refer to ordinary farm land of a decidedly better type than that upon which the original slag experiments were conducted. The Welsh Plant Breeding Station laid down an experiment in 1931 on a field which very happily and in accordance with anticipation developed little or no white clover except on the plots where the wild white had been sown.¹ We obtained our evidence in terms of live-weight increase from sheep tethered on the plots. One series of plots consisted of leafy perennial rye-grass and cocksfoot only, and the other of these two grasses with the addition of wild white clover. The with-wild white clover (5 lb. at 5s. per lb.) mixture cost 25s. per acre more than the grasses only. During the three years 1932-34 the plots in which clover had been sown gave 168½ lb. more live-weight increase than those sown only with rye-grass and cocksfoot. It is not for a moment to be supposed that anybody would use rye-grass and cocksfoot alone as a seeds mixture, but the whole point of the experiment was to compare a clover with

¹This experiment was laid out on an 8-acre field and involved the use of forty-eight pairs of tethered sheep. It was designed to test the feeding value of mixtures with and without wild white clover, and of the leafy, persistent strains of grasses in comparison with the ordinary non-leafy strains as normally employed by farmers. The experiment is now in its fourth experimental year, and will be fully reported at the end of this season.

DOES IT PAY TO SOW WILD WHITE CLOVER?

a non-clover sward on ordinary middle-class farm land with a view to assessing, if possible, the monetary advantage that clover might be expected to give. Many ordinary *Agrostis* pastures would in fact be of much less feeding value than a sward consisting only of cocksfoot and perennial rye-grass. At 4½d. per lb. of live-weight increase the with-clover plots would have earned 63s. more than the grass-only plots in the course of the three years, and incidentally would have handsomely paid off the cost of the clover seed.

In the case of rough grazings (fescue-*Molinia*-*Nardus* pasture) in which there is little or no leguminous herbage—perhaps at the best only small quantities of bird's foot trefoil—slagging alone produces almost negligible benefit. Thus, 'manuring for mutton' experiments conducted in 1915-16 by the late Professor Abel Jones and myself on such grazings showed a response from the slag plots of no more than 15½ lb. live-weight increase per acre over and above that obtained from the unmanured plots. Trials conducted since 1931, where the phosphating has been supplemented by the sowing of wild white clover, have shown a phenomenal development of clover and greatly improved swards. No opportunity has yet presented itself for conducting standard experiments on the Cockle Park plan on such swards, but the evidence of their carrying capacity, supported by yield data from small plots, can leave no doubt that the improvement effected has been altogether greater than would be represented by a gain of merely 15 lb. live weight per acre. Indeed the methods so successfully adopted by Mr. Bligh, to be discussed in a subsequent chapter, have been largely based on the benefits resulting from the combined use of phosphates and wild white clover seed.

An important fact—and one which our trials have amply demonstrated—to be remembered as bearing on the economics of the wild white clover question is that on poor soils, such as those now under consideration, the clover when well established and supported by phosphates contributes a large proportion, often up to 30 per cent., of the total eatables offering to the sheep, with corresponding enrichment of the protein and calcium content of the herbage. It also follows that without ample clover the highest yield of dry matter per acre would not be obtainable.

ETHICAL AND FINANCIAL ASPECTS

Taking the evidence as a whole, it would seem almost beyond dispute, therefore, that the supplementing of heavy phosphating with the seed of wild white clover would make it profitable to tackle land where phosphating alone would produce little benefit and no profit.

Twenty shillings per acre would be a generous allowance for both the purchase and sowing of all the wild white clover necessary. This added to the cost of three tons of slag used in twenty-one years, and on the basis of the Cockle Park results previously discussed, would still leave an annual return of over 15s. per acre over the full period of twenty-one years. It must be borne in mind that the type of land we are considering would carry a rental of from about 2s. 6d. to no more than 5s. per acre.

In this section I have only been concerned with the intrinsic money-earning capacity of wild white clover as such; in subsequent chapters I shall deal with the various methods of turning this fact to economic advantage.

Does it pay to use a sensible seeds mixture? By a sensible seeds mixture I mean one that is not only well balanced, but which includes wild white clover and the new strains of leafy and persistent grasses, and I am concerned with leys left down for upwards of four years, and in the present instance with grazing rather than hay. The simplest of sensible grazing mixtures for many purposes, and perhaps the most sensible of all, would consist of leafy perennial rye-grass and wild white clover only.

Experiments testing this point have been in progress for many years at the Welsh Plant Breeding Station. By means of live weight increase of sheep we have compared an ordinary 'farmer's mixture' (consisting of the commercial seeds of a large number of species) with a 'simple leafy mixture' (consisting chiefly of leafy perennial rye-grass and wild white clover) and with an 'improved farmer's mixture' in which the leafy strains have replaced the ordinary commercial seed. Results obtained over a period of three years have shown that the 'simple leafy mixture', after paying for the additional cost of the seed, gave a monetary return greater by 10s. 4d. per acre per annum than that of the 'farmer's mixture', while the 'improved farmer's

DOES IT PAY TO USE SENSIBLE SEEDS MIXTURE?

mixture' had an earning capacity 3s. 4d. per acre per annum greater than that of the 'ordinary farmer's mixture'.¹

This evidence is of special significance in relation to land improvement, for we are dealing with mixtures for swards that would be left down for not less than six, and perhaps for more than ten years, and with land of no great quality. Both small plot trials and large-scale field trials with the 'simple leafy mixture' and with mixtures conforming to the 'complex leafy' type scattered throughout Wales—many of them in their sixth harvest year—show beyond a shadow of doubt that such mixtures persist and remain productive long after the ordinary 'farmer's mixtures' have shot their final bolt—which is usually in the third, or at the best the fourth, year.

Does it pay to maintain land in high-class temporary grass? Until a series of experiments have been conducted on land of different classes, and with the different types of stock, and on a farm scale—the one farm all permanent grass, and the other sequential temporary leys—this question in all its financial bearing cannot be finally answered, at least to the satisfaction of the sceptics. Having regard to the enormous acreage of poor permanent grass in the country, I can conceive of no type of experiment that would prove of greater value in relation to the livestock industry.

Important evidence does, however, exist, and of a type the suggestiveness of which it is difficult to gainsay, and which points only in one direction—to the temporary ley.

Data based on accurate records and live-weight increases have been obtained, for example, by Mr. E. J. Roberts at Bangor from a permanent pasture and, respectively, from two temporary leys in their fourth year, one with but little wild white clover and the other (in which wild white clover had contributed to the mixture) with a considerable quantity in the sward. The permanent pasture had not been under the plough in living memory, and has always been considered as of excellent quality. The temporary leys were not of special quality and had been sown with ordinary commercial seed, except for the wild white included on one of them.

¹This trial is now in its fourth experimental year. A detailed report will be published by the Welsh Plant Breeding Station in due course.

CHAPTER XI

The Financial Aspects of Improving Rough and Hill Grazings

Evidence from the Cahn Hill Improvement Scheme. Can ploughing up and sowing down be made to pay? Estimated costs and incomings. Depreciation of tractor. Repetition of operations. Contractor's charges. Duration of benefits. Can the fattening of lambs at high elevations pay for itself? Various crops and methods; their influence on fertility. Does it pay to rough-up, phosphate and sow out? Implements and methods. Does it pay to manure and sow seeds only? Evidence from Scotland. Overhead charges.

I have now to approach the matter of cost—gross expenditure and net returns. I have very little irrefutable data to go upon, but, as will transpire in the sequel to this chapter, if I am only able to set some reasonable limit to the duration over which credit facilities should be forthcoming in respect of the various acts of land improvement, I shall have made a sensible contribution to the problem of rejuvenating our derelict acres.

With reference to the financial aspects of improving the poorer lands—the rough and hill grazings—I shall have to draw upon what evidence we have so far accumulated in connection with the work of the Cahn Hill Improvement Scheme.¹ It is with serious misgivings, and with the full knowledge that I lay myself open to considerable criticism that I shall draw guarded and tentative conclusions from operation costs and returns

¹The lands of the Cahn Hill Improvement Scheme are situated behind Devil's Bridge in Cardiganshire, and consist in all of nearly 3,000 acres. All the evidence here discussed has, however, been obtained from the land situated near the headquarters farm on the Hafod Estate at elevations above sea level of from about 1,000 ft. to 1,300 ft. with one small area reaching down to 900 ft.

CAHN HILL IMPROVEMENT SCHEME

obtained from an undertaking—and one of a revolutionary character—inaugurated as recently as Lady Day 1933. I do so, however, not only because if standing for a serious campaign of land improvement carried into the most uncompromising of country I must endeavour to give some indication of the order of expenditure that is entailed, but also because I am so frequently asked by those who are already, or who contemplate, following our methods for information as to costs and returns.

It is germane to this aspect of the question to emphasize the fact that the land upon which the Cahn Hill Improvement Scheme is operating is exceedingly difficult land, and therefore the costs are necessarily high and demonstrably higher than they would be on easier land, while the methods of improvement adopted, as has been made abundantly clear in my chapters on technique, are applicable alike to easy and difficult land, uplands and lowlands. The motive power in connection with all the work on the Cahn Hill lands has been the Caterpillar tractor—the 'FIFTEEN' and 'TWENTY' models having been employed. The fertilizers have been taken by lorry to the nearest vantage point and on two-wheeled trailers behind the tractor to the various areas on the hills. Horse labour has been but little employed (except on special horse areas) and for the most part only with the seed drill.

As in the last chapter, I will endeavour to answer a number of explicit questions.

Can the ploughing of rough grazings and the sowing down in a seeds mixture be made to pay? Up to the present we have no data for any large paddock treated only by a single method. We have, however, considerable acreages of improved pasture variously produced within one fenced area; our records show with a high degree of accuracy the cost per acre of the different treatments. We also know with precision the stocking capacity and performance of the areas first taken in hand. We can, therefore, examine the question of costs and returns by considering hypothetical cases—each based on accurate costings relative to operations and recorded achievements relative to stocking.

The actual hill land (at about 1,000 ft. to 1,300 ft. above sea level) upon which the trials under immediate consideration are

IMPROVING GRAZINGS : FINANCE

being conducted had not regularly wintered sheep, at all events under any recent management, prior to being taken over by the Cahn Hill Improvement Scheme, and the summer stocking was not much in excess of one ewe and lamb per acre. On an area of thirty-one and a half acres, of which twenty-five acres have been improved by various methods, we have wintered during the first winter (1933-34) and the second (1934-35) a sufficient head of sheep, supported by store cattle (October-November 1933) to justify the assumption that the area in question is capable of wintering two ewes to the acre.¹ From the beginning of May last year (1934) until the end of August, with the exception of a rest period of about ten days towards the end of May, the area maintained 128 ewes and 128 lambs. Provision should be made for a short rest of the new pastures during May; where more than one block has been improved this is relatively simple. The health and appearance of the ewes and live weight increase of the lambs left nothing to be desired. On the basis of our records the financial position relative to this block can be most satisfactorily and conservatively expressed in the form of a hypothetical transaction.

In September buy 128 draft ewes at 17s.	-	£108	16	0
Winter 66 away at 6s.	-		19	16
			<hr/>	
		£128	12	0

The above sum of £128 12s. represents the outlay for stocking the block. Sixty-two of the bought-in ewes (two per acre) are to be wintered on the block, and therefore occasion no further outlay.

In April the ewes wintered away are to be brought on to the block to join those which had been wintered there, and in September (one year after the purchase) both ewes and lambs will be sold off. If we make a deduction of six ewes and six lambs to cover losses, assume a lambing average of 90 per cent., and allow a depreciation of 1s. per ewe for the period September-September (actually there was an appreciation of approxi-

¹During the first winter (1933-34) it carried 70 sheep for 13 weeks from the middle of January, and it had carried 15 two-year-old cattle from the end of October to the end of November. During the second winter (1934-35) it was in fact carrying two ewes to the acre.

ESTIMATED COSTS AND INCOMINGS

mately 5s. per ewe during the period 1933-34) the earnings would be:

122 ewes at 16s.	-	-	-	-	-	£97 12 0
112 lambs at 18s. 6d.	-	-	-	-	-	103 12 0
						£201 4 0

If we deduct the original cost of the flock of ewes and the wintering of those sent away, we arrive at the figure of £72 12s. as the gross earning from the block as a whole. To this, however, must be added £2 17s. for wool, bringing the earnings up to £75 9s. or £2 8s. per acre. No credit has been given to the possibility of cattle grazing; indeed it might with some justice be argued that the block should be debited rather than credited with any cattle days, since store cattle used with discretion are sward improvers, but in themselves leave no margin of profit—they are just implements and manufacturers of dung.

The productive capacity of the block, namely, £2 8s. per acre per annum, has been calculated on the assumption that the whole area of thirty-one and a half acres—instead of only twenty-five acres—had been improved. This figure then is put forward as the ‘incoming’ standard against which to judge the ‘outgoings’.

All I can do as to ‘outgoings’ is to assume that all the improvements on the block were made by a single method. At first, however, I will consider operation costs in relation to different types of land, and in doing so I will take our recorded figures in mechanic hours, men hours, fuel and oil, ignoring for the moment overhead charges and depreciation on the tractor.

I am able to compare ploughing costs under two sets of conditions, and scratching-up with a rotary cultivator on land of intermediate character. As to ploughing, in one case we did thirty acres on steep, difficult country with the Caterpillar ‘TWENTY’ and the big ‘Junotrac’ two-furrow plough, and in the other, thirty acres of less steep land with the Caterpillar ‘FIFTEEN’ and the three-furrow ‘Midtrac’ plough.

The more difficult area worked out at 9s. 1d. per acre, and the easier (but not easy) area at 7s. 6d.—all subsequent operations, including distributing manures, harrowing down, and rolling and covering and sowing seeds, cost 6s. 2d. per acre on the difficult, and 5s. 9d. on the easier area.

IMPROVING GRAZINGS : FINANCE

The cost per acre of roughing-up land with the 'Austral' rotary cultivator behind the Caterpillar 'TWENTY' has worked out at 6s. per acre.

I will now set out the full costs for the most difficult of the ploughed areas: they are:

Ploughing per acre	-	-	-	-	-	£0	9	1
Subsequent operations	-	-	-	-	-	0	6	2
Manures (6 cwt. slag and 1 cwt. nitro-chalk delivered to the area)	-	-	-	-	-	1	5	11
Seeds ¹ say	-	-	-	-	-	1	10	0
Say per acre						£3	11	2

The comparable costs for the 'Austral' cultivator up to this point, at their lowest—that is to say with direct manuring and sowing on the surface as left by the 'Austral'—would be:

'Austral' per acre	-	-	-	-	-	£0	6	0
Sowing, manuring and covering	-	-	-	-	-	0	4	8
Manures (6 cwt. slag and 1 cwt. nitro-chalk)	-	-	-	-	-	1	5	11
Seeds ¹	-	-	-	-	-	1	10	0
						£3	6	7

The 'Austral' does not appear from these figures to work out much more cheaply than the plough, but a great deal more experimentation in methods of drastic scratching is required before we can state what is the correct implement to use or legitimately estimate the cost of such operations.

I will now return to my hypothetical case—the area of 31½ acres from which I have estimated the incomings at £2 8s. per acre per annum. I shall assume that the whole of the improvements were based on ploughing up at the higher of the two ploughing costs above cited; the total operation costs (including seeds and manures) having amounted to £3 11s. per acre.

In addition to these cash outgoings in operations, seeds and manures, we have to take into consideration two major items difficult to assess, namely, depreciation and general maintenance charges on the tractor and fencing. Fencing is not an absolute necessity, but where complete reclamation is under-

¹Allocated as wild white clover cleanings at about 8d. per lb.=10s.; crested dogstail and bottom grass cleanings 3s.; indigenous rye-grass cleanings 12s., and reinforced with pedigree cocksfoot and perennial rye-grass 5s.

DEPRECIATION OF TRACTOR

taken and the best use is to be made of the new swards, it is wiser to regard the enclosure of paddocks as essential. From the grazing point of view the evidence suggests that it is actually desirable that the new paddocks should consist partly of improved and partly of unimproved grass. In practice this would always be the case, because, when tractoring, islands of impracticable ground will be freely met with on land of the type we are considering. The new paddocks should always be planned with a view to utilizing existing fences to the best advantage, and to achieving the maximum of enclosure per hundred yards of new fencing. Manifestly the number of yards of fencing per acre to enclose a paddock will vary enormously according to the size of the enclosure, its relation to other enclosures both in contemplation and already in existence. A further complication arises relative to costing, and that is whether the improved portions should bear the whole expense. In order to estimate throughout on a conservative basis per acre of improved land, we have in all cases divided the total yardage of fencing by the number of acres of such improved land within the paddock. Our yardage per acre of improved land thus arrived at for the paddocks we have made has varied from approximately forty-eight to thirty-three yards.¹ The size of the paddocks has varied from sixty acres gross with thirty improved, to sixteen acres gross with fourteen improved. Our fencing through and through (labour, materials and carriage to the ground) has cost us a little under one shilling per yard—at say one shilling this gives us a cost per acre for improved land varying from £2 8s. to £1 13s. Had the costs been calculated on the gross acreage of the paddocks, the variation would have been from £2 2s. to 17s. 6d. per acre. On the basis of the figures we have available, our average price for fencing per improved acre would be £1 18s., and this is the figure I shall use as my basis. Naturally the cost would usually be greater per acre if enclosing on the basis of paddocks of only about five to ten acres, but, on the other hand, many small areas demanding improvement are already fenced.

I must now turn to the question of depreciation and maintenance costs of the tractor. Estimates for the depreciation and

¹Allowing in one instance half yardage on about one-fifth of the total length of the fence shared with another paddock

IMPROVING GRAZINGS : FINANCE

repairs on a tractor are usually based on the life of the tractor in working hours. This is often placed at 8,000 hours. Mr. Roland Dudley, however, prefers a more conservative estimate of 6,000 hours. The experience we have gained with the Caterpillar 'FIFTEEN' and 'TWENTY', and even with our hard work, would seem to indicate that these tractors would stand up to something approaching 6,000 hours. Fairly costly repairs would, however, be necessary to the tractors from time to time. In the case of our 'TWENTY', repairs to the tracks were first necessary after 2,300 hours, and in the case of the 'FIFTEEN' after 2,000 hours. These repairs (including carriage to the dépôt in London) worked out at about £50 per tractor. Mr. Roland Dudley has estimated his depreciation and repairs at 2s. per hour, and, working on the principles he has adopted and with such evidence as we have been able to accumulate during three years' working, it would appear that 2s. 8d. per hour would be a conservative figure to employ in connection with the present estimates.

We can now express the costs per acre relative to the making of the improved sward as under:

Operation costs (including seeds and manures)	£3	11	0
Depreciation on tractor and implements	-	0	16 5
Fencing	-	1	18 0
Total per acre	-	£6	5 5

The estimated gross incomings in sight per acre have been put at £2 8s.; from this we have to deduct rent and shepherding. The average rental of the kind of land we are discussing would vary from perhaps less than 2s. to certainly no more than 4s. per acre—we will put it at 4s. On the basis of the total of our acreage carrying sheep, shepherding has cost 1s. 8d. per acre; if we calculate on the basis of sheep, the area under consideration would have cost 4s. 6d. per acre per annum to shepherd. I propose to put the figure at 3s., for I consider a compromise between acreage and number of sheep is a just one and would accord with the facts. We have, therefore, to deduct 7s. (4s. for rent and 3s. for shepherding) from our gross earnings, which leaves us with £2 1s. per annum to pay off the costs totalling £6 5s. 5d. The operation year would not be a full earning year, so that it would require four years from the date of ploughing the first sod to have completely cleared the account.

REPETITION OF OPERATIONS

This does not take us nearly far enough, however; we have made no debit for general overheads, we have assumed that the sward is as good as ever at the end of the fourth year, and that no further care of the sward has been necessary. On the basis of general experience I should wish to apply further phosphates during the first three years, and then to apply at four-yearly intervals—if all the dressings were at the rate of six cwt. per acre this would total thirty cwt. in fifteen years. I should also wish at some stage during the first fifteen years, perhaps at the tenth year, to have the sward up and repeat the whole operation. I should then have completed a job which with every confidence I would expect with the aid of regular phosphating (at four- to five-yearly intervals) and proper attention would stand for another twenty or more years without being again broken up. I will now set out the various estimates and costs on the basis of my fifteen years' programme:

Outgoings.

Operations first time	-	-	-	-	£3	11	0
Operations second time	-	-	-	-	3	11	0
Depreciation on tractor and implements	-				1	12	10
Fencing	-	-	-	-	1	18	0
Interim phosphating, carriage and distribution	-	-	-	-	2	14	0
Care of sward at 2s.	-	-	-	-	1	10	0
Fifteen years' rent at 4s.	-	-	-	-	3	0	0
Fifteen years' shepherding at 3s.	-	-			2	5	0
					<hr/>		
					£20	1	10

Incomings.

Gross earnings per annum × 14	-	-	-	-	£33	12	0
Balance in favour of incomings	-	-	-	-	£13	10	2

A few explanations are necessary relative to this balance sheet. Phosphates (six cwt. basic slag) will have been applied at each of the two seedings out; three further dressings will be added during the fifteen years, and these with cartage and spreading will entail a gross expenditure of £2 14s.

The sward would not require attention every year, but it might need a mow-over occasionally; this contingency is met by an annual debit of 2s. Shepherding has been charged for the full fifteen years, for while the swards are developing, sheep will

IMPROVING GRAZINGS : FINANCE

have to be kept out of the paddock. The period of preparation and sward development for the two seedings would not together put the paddock out of earning for more than one year; it is therefore entirely legitimate to multiply the earnings by fourteen, and this is what I have done.

On the showing of my hypothetical balance sheet, at the end of fifteen years the land improver will have paid off all his costs and have over a balance of £13 10s. 2d. With this he has, however, to meet interest charges and contribute a fair and proper quota to his general maintenance and administrative accounts. The interest charges should amount to very little, for he should be able to refund his loan as he goes along, and, if he has borrowed at $3\frac{1}{2}$ per cent., should not exceed 40s. in all per acre spread over the fifteen years—the maximum sum on which he would pay interest in any one year would not exceed £7.

I am admittedly building up a considerable argument on a slender foundation; I am, however, using the only materials that I have available, and I have made it abundantly clear that I am dealing with my facts hypothetically. As to costs I am on comparatively firm ground. Liberal as I have been with phosphates, the possibility of an under-estimate must be taken into account—the incremental dressings could with advantage be given in terms of rock phosphates, when the total phosphates per acre could be increased without additional cost. In any event a further 30s. added to the outgoings would meet any demands in this respect. If the indications of improvement were greater than anticipated, I would probably increase the cost of my second seeds mixture—perhaps up to £2 10s. (instead of £1 10s.). Against this contingency I have, however, made no allowance for an improved productivity from my second sward—which in any event would be likely to be 15 per cent. greater than that of the first sward—and if the expensive seeds mixture was justified it might easily be greater by 30 per cent.

A more important issue relative to costs would be the question of contractor's charges, assuming that most of the major operations were contracted out. On some types of ground after the ploughing and first harrowing the job could be completed by horse labour—on the type of ground on which my costs have

CONTRACTOR'S CHARGES

been recorded, the tractor would have to be in attendance to the end. I have depreciated the tractor generously, paid my mechanic a good wage, so to add 30s. per acre extra for contractor's charges at each seeding out should I think be more than ample, and particularly so if the cut prices of haulage contractors are any guide. Much of the haulage could in fact be done by a Fordson, and on land less severe than that under review a Fordson could often do the ploughing. It must be constantly borne in mind, therefore, that I am here concerned with conditions demanding a maximum of outlay in relation to every item. If, however, we add this contractor's charge of £3 to the 30s. for extra phosphates, and put our interest charges at say £2, our total outgoing becomes £26 11s. 10d., and our balance in hand at the end of fifteen years would be £7 os. 2d. per acre.

On the score of incomings I can only say that on the basis of live-weight increases and actual performance we could have shown better returns than those used as the standard. Perhaps the two ewes per acre might not be wintered every year, but on an average and with go and come between different improved areas and over a run of years I think the figure is justified. The outstanding assumption is the sustained productivity of the sward—and that is based on the results of small plot trials which have been under observation since 1931.

I will revert to the question of general maintenance and administration at the end of the chapter. I only want here to emphasize the fact that the hypothetical case I have discussed has been built up around an extraordinarily difficult piece of ground involving maximum depreciation charges and maximum expense, while my incomings have been calculated on a sward the average quality of which over the full twenty-five acres improved has not represented the full potentialities of improva-bility. Apparently, however, everything can be paid off within fifteen years, leaving a balance over to the credit of maintenance and administration, and then many years of simple and profitable enjoyment of benefit.

Such can be the only possible legitimate hope of the land improver, and the only rational way of looking at the matter—land improvement is a long-range undertaking.

. Can the fattening of lambs on poor land reclaimed from rough grazings at high elevations be made to pay for itself? I put the question in this way because the chief concern of the land improver is to build up fertility in an ordered and steady manner, and to offset his necessarily heavy outgoings as quickly as possible and by every rational means at his disposal.

There are three ways in which the land improver may produce fattening crops with a view to serving his special ends. He may sow rape, hardy green turnips and Italian rye-grass with his mixture intended to develop into a long-duration sward. In this case if the lambs pay for the 'fattening' ingredients in the mixture, pay one year's rent, and one year's shepherding, and pay for the nitrogenous manure, they will have paid for themselves. For by their treading and dunging they will have contributed enormously to the development of the permanent sward, and therefore to the final writing off of the operation account. The land improver, with a view to building up a store of fertility, may elect to take a sequence of fattening crops over a number of years before he ventures upon sowing down his long duration mixture. He may adopt two methods to this end. He may plan for a sequence of two-year leys, relying on rape, hardy greens and Italian rye-grass (supported by Yorkshire fog on the poorest situations) to fatten lambs in the year of sowing. In his mixture he will also include perennial rye-grass and white clover in the hope that the second-year sward will in any event bring his young lambs to a forward condition. Finally, he may decide to rely solely on a series of one-year fattening crops—rape, hardy greens, Italian rye-grass and Yorkshire fog. Because newly reclaimed land will be weedless, he will hope to be able merely to disk or harrow up each crop when finished and immediately sow down again—no further ploughing should be necessary for some years. In connection with all these methods of growing fattening crops he will also (by the inclusion of Italian rye-grass) contribute to his winter keep—a matter of great importance.

If either of the two latter methods is to be successfully adopted each fattening crop on the face of it must pay off all its own cost, that is to say, cost of the seeds mixture, the nitrogenous manure, rent and shepherding, as well as the scratching-up and other operations consequent upon putting down the second and subsequent

FATTING OF LAMBS AT HIGH ELEVATIONS

sequential crops. The major operations of ploughing, fencing and initial phosphating are to be debited to the ultimate sward which is the final goal. We are here faced with a most interesting series of problems—all of a technical and financial character. The event might well show that in the long run—thinking in terms of a fifteen to twenty years' sinking fund—a sequential series of one year fattening and fertility-producing crops might pay even if the crop so obtained for the first two or three years left a small debit to swell the first operation costs, finally to be written down by the ultimate long-duration sward; while if only small credits annually accumulate it might be the paying thing to do—in the long run—to maintain the sequence of fattening crops until all the original operation costs were liquidated.

I am enlarging on this subject because it illustrates so admirably firstly, the connection between technique and finance; secondly, the need of long-continued and detailed investigations relative to technique-finance—they are wedded beyond hope of divorce—and thirdly, and crucially, because land improvement, both as a subject for investigation and as a business undertaking, can only usefully or profitably be approached as a long-range proposition.

Unfortunately the summer of 1934 (the first opportunity we had of testing the matter on a considerable scale) was abnormal to a high degree; because of the drought and the ravages of the turnip-flea our rape was everywhere a complete failure. The hardy green turnips and the Italian rye-grass nowhere made a full crop, and came into usefulness too late in the season to yield a normal return—even on such bulk as they produced. Only the Yorkshire fog succeeded under all conditions in establishing itself well. Our first endeavour was to set conditional and positional limits to the scope for attempting fattening crops with some hope of success. We knew that such crops are successfully used on relatively poor land at elevations up to about the 700 ft. contour—could we use them and fatten lambs on newly reclaimed land up to the 1,300 ft. contour? Despite the drought, we have shown that it is possible to do so even on the most unpromising piece of land we took in hand, and on the 1,300 ft. contour. The fact that in all between 10th September, 1934 and 5th February, 1935, we sold off from about fifty acres of newly reclaimed

IMPROVING GRAZINGS : FINANCE

land standing between the 900 ft. and 1,300 ft. contours 544 fat lambs and wethers under conditions where before such a thing had never been attempted constitutes a very considerable technical achievement, and one that cannot be without promise for the future development of such land. Under the conditions of 1934 it was apparent, however, that our fattening crops were successful in exaggerated proportion to the kindliness (relatively speaking) of the land upon which they were sown.

We proved a further technical point of great interest, namely, that it is entirely satisfactory to prepare for a second fattening crop by merely disking-up without the necessity of further ploughing, and we have costed the necessary operations.

I will now examine the financial aspects of these, our first, attempts conducted under singularly adverse conditions. By far the most successful crop we obtained (but even so it came late and there was but little rape) was on a field at about the 900 ft. contour—which had been broken for the first time. The rape, hardy greens and Italian rye-grass were sown as a nurse to a permanent mixture. We turned the first batch of fattening lambs into the field (seven acres) on 18th August, and fattened 15.7 lambs per acre. The average live weight increase per lamb was 6 lb., giving a total live-weight increase per acre of 94 lb., which at 5d. per lb. would have earned £1 19s. 3d.

After the field was rested it would carry two sheep per acre from January to April, this at one sheep for the whole winter would give a further credit of 6s. to the crop—allow half the credit to the permanent mixture and half (3s.) to the fattening crop, and the total earnings of the fattening crop would be £2 2s. 3d. We are asking the crop to pay off the following items: rape, 3 lb.; hardy green turnips, 3 lb.; and Italian rye-grass, 14 lb. = 12s. 3d.; 1 cwt. nitro-chalk, 7s. 6d.; rent, say 5s.; shepherding, say 3s.; total, £1 7s. 9d.

On this showing, and asking the least we have to ask of our fattening crop, it has met its obligations and left a balance of 14s. 6d. per acre with which to start writing down the sinking fund for the particular paddock.

I will now take the costs connected with disking-up a first fattening crop with a view to putting down a second; they are as follows, per acre:

VARIOUS CROPS AND METHODS ; THEIR INFLUENCE

	s.	d.
Harrowing out old crop with 'Baronet' disk and 'Aitkenhead' harrows behind it and harrowing in seeds and manures - - - - -	2	7
Broadcasting seeds and nitro-chalk (1 cwt.) - - - - -	2	0
Depreciation on tractor - - - - -	3	5
Total per acre - - - - -	8	0

On this basis, and assuming that the field so treated was capable of fattening not less than fifteen lambs per acre at an average live weight increase of 6 lb. per lamb of a value per lb. of about 5d., it would appear as if a sequence of fattening crops would meet its commitments and over a run of years contribute small credits towards the liquidation of the sinking fund.

If, however, we examine the situation from the standpoint of the least successful paddock, instead of the most successful, it is only debits we should have accumulated on all counts during the singularly adverse season under consideration. If our fattening crop had been treated as a nurse to a permanent mixture on the least successful field, then even so, on the basis of the evaluation adopted it would have entailed a drag on the sinking fund of the order of about 4s. per acre.

Taking all this evidence as a whole, I think it has contributed something exceedingly valuable to the land improver, and it may be fairly summed up as follows. We have tested out fattening crops to the extreme conditional limit of their possible practicality, and in an exceptionally adverse season. In anything like a normal year, even under the most extreme conditions, treated as a nurse crop, with hardy green turnips wholly displacing rape and Yorkshire fog supporting Italian rye-grass, the commitments would probably be met. If used as a sequential series of fattening crops on such situations (up to 1,300 ft.) success over a run of years would, however, be dubious, but I would not care to prognosticate that success would be definitely ruled out of the question. We shall continue to test the matter.

On the better areas carefully selected, and up to about the 1,100 ft. contour, I think success could be prognosticated over a run of years for even the sequential series of fattening crops, but more reliance should be put on hardy greens than on rape, and Yorkshire fog must supplement the Italian rye-grass.

IMPROVING GRAZINGS : FINANCE

What I think the results have proved beyond the least doubt is that for land improvers more fortunate and less daring than those who are responsible for the Cahn Hill Improvement Scheme, the sequential series of fattening crops is a most valuable method of approach to the problem. I am thinking of bracken country and fescue pastures and the poorest *Agrostis* pastures standing between the 600 ft. and 900 ft. contours, and over large areas of such country if need be the whole sequence can be put through with horse labour, and, under these kindlier conditions, instead of small losses, appreciable gains could be confidently expected. I cannot here refrain from interjecting the remark that the work of the Cahn Hill Improvement Scheme, because conducted under extreme conditions and under almost maximum difficulties, will probably have more to teach land improvers in general—those enjoying more average conditions—than if operations were being conducted on easier and kinder land. That at all events is the standpoint I have taken up from the very beginning.

Does it pay to scratch, phosphate and sow seeds on selected areas on open sheep-walks? This is perhaps the most important and generally applicable procedure for open hill country, but it is almost impossible to cost. I am, of course, aware that in the past good results have not always followed on the adoption of this simple method. The harrowings had, however, been performed at slow speeds with horses, and were seldom, if ever, drastic enough, while frequently insufficient attention was given to the question of keeping down roughage.

Fencing is not necessary, and is probably not desirable; the whole idea, as I have explained, is to provide each walk with considerable areas of protein- and mineral-efficient herbage. The order of the benefit that will follow is suggested by the evidence as to phosphates and wild white clover discussed in the last chapter, but actual earning power can only be accurately estimated in terms of increased carrying capacity, better wintering, improved health of the flock, and by more and larger lambs, as shown by the performance of the walk as a whole over a period of years. The evidence brought forward as to the earning power of the sward developed on a completely broken surface, supported by observation on areas treated (in 1931



Roughing-up hill pasture
From 'The Farmer and Stockbreeder'



Harrowing and clearing roughage

IMPLEMENTS AND METHODS

and subsequently) by the methods immediately under discussion, shows that the benefit will begin to be apparent within about four months, and strongly suggests, since the heavy cost of fencing will not have been entailed, that such treatments (including an interim phosphating) should pay for themselves no less, and probably much more, quickly than the complete reclamations.

The operation costs should be estimated to cover a heavy initial dressing of phosphates (say 12 cwt. of slag) and a liberal sowing of wild white clover (say not less than 10 lb. of cleanings at about 8d. per lb.) and some crested dogstail. The cost per acre of the actual scratching will vary according to the implements used, and the number of times over—for really drastic treatment it will not be less than for a rotary cultivator (*i.e.*, about 6s. per acre), but in order to establish clover on a heavily phosphated surface, drastic treatment is in many cases unnecessary. A fair average estimate of costs per acre would be as follows:¹

Harrowing with a heavily tined implement, say	£	0	6	0
Cost and carriage to area of 12 cwt. slag and				
1 cwt. nitro-chalk - - - - -		2	0	6
Distributing slag and seeds - - - - -		0	5	0
Price of seeds - - - - -		0	12	0
Depreciation on tractor - - - - -		0	8	0
		<hr/>		
		£	3	11 6

If we again take fifteen years as our basis and add £2 14s. for interim phosphating (a further 18 cwt. of slag) and allow £1 10s. for the care of the sward, the total expenditure on the sward itself per acre for the period would be £7 16s., as compared with £14 16s. 10d. for the area completely reclaimed and fenced. This on the assumption that the various jobs had not been contracted out. If my estimates have been reasonably correct, it

¹I have not made any estimate for the cost of burning. The actual cost depends so very much on the conditions. Much burning can be safely done by the shepherd on his rounds for the price of matches only. It is a pity that farmers with their shepherds do not combine together for the purpose of regularized burning in the same way as they do in Wales for shearing. Burning, properly appreciated, should be regarded more in the light of a sport than of a business. To effect a considerable burn absolutely to programme is a real achievement, and a most exhilarating and exciting enterprise for which nobody should demand payment.

IMPROVING GRAZINGS : FINANCE

would appear that the scratched area in fifteen years would have liquidated its sinking fund with an appreciable balance over to be shared between profit, maintenance and administration; and on this showing I think it safe to assume that this smaller outlay, and postulating a lesser benefit, could be depended upon amply to have met its obligations.

Does it pay to sow seeds and manures without any cultivation on open sheep-walks? In the chapter on technique I explained that wild white clover and Yorkshire fog to some extent could often be established on an uncultivated surface with the help of phosphatic manures only. Such establishment is easiest to ensure under conditions of fairly high rainfall and on soils (*e.g.*, peat) retentive of moisture. In all cases it is, however, necessary as a preliminary to have burned or cut off the rough vegetation, and by subsequent mowing over or hard grazing to keep the roughage in subjection. Hill-sides too steep or too rocky to cultivate or mow over should be given a general manurial dressing of lime, nitrogen and phosphates—this will attract the grazing animal to such positions and the roughage will be gradually cleared. After two or three years, such areas may be re-phosphated and the seeds of wild white clover sown. Such treatment as this is not unduly expensive, and the ultimate benefits are considerable.

Wet and more or less boggy areas consisting of a rough and mixed vegetation of *Molinia*, *Nardus*, *Scirpus*, cotton grass, *Sphagnum* moss, bog-myrtle, bell heather, and other plants of little grazing value can be greatly improved by the method under consideration, and it is on such situations that Yorkshire fog is of the greatest value.

A pioneer in the use of this method is Mr. A. Allan of Auchinleck Farm, Newton Stewart, Wigtown. Mr. William Davies visited Mr. Allan's farm in February and was greatly impressed by what he saw, and I am indebted to Mr. Allan for the particulars I now give. Mr. Allan many years ago started by heavy phosphating, and in 1924 began supplementing his phosphates by sowing loft-sweepings, and in 1926 and subsequently he has used seedsmen's cleanings. The seeds are broadcast from a cart on a windy day at the rate of about 100 lb. to the acre. Mr. Allan always sows in April with a view to giving sufficient time

EVIDENCE FROM SCOTLAND

for the seeds to become well established before the winter. The phosphating has been at a heavy rate, both basic slag and rock phosphates having been employed.

Mr. Allan has found it essential to keep the roughage cut down, and the really good results have only been obtained where he has sown both seed and phosphates on a generous scale. Over 100 acres of this very poor land are now under treatment, and it is of great interest to note that Mr. Allan likes to include the seeds of buttercups and other herbs in his sowings in order, as he says, to provide a beneficial change of diet for his sheep—a mineral-efficient ration, in other words.

The results which Mr. Allan has obtained by these simple and relatively cheap methods have been nothing short of remarkable. On some of the areas treated, and on land from which hay had never been cut, Mr. Allan has taken 30 cwt. of tolerably good hay per acre. Yorkshire fog, rough-stalked meadow grass, timothy, crested dogtail and wild white clover have to a large extent replaced the rough and useless herbage. On some at least of the improved fields perennial rye-grass contributes a not inconsiderable proportion of the herbage. Mr. Allan has been able to finish off black-face lambs on the late summer growth (August to September) and to winter hogs on his improved areas. All these sheep subsisted on grass alone, no other food being given, and they came off the foggage in excellent condition.

Mr. Allan, as the result of his reclamations, regularly winters a considerable flock of hogs at home, the sheep having access alike to the improved and unimproved land, and it is now proposed as a result of the greatly enhanced quality of the hay to stock Galloway cows at Auchinleck.

This pioneer endeavour of Mr. Allan is of the greatest importance. He started exploring for himself many years before the agricultural scientist had begun to pay serious attention to land of this sort. Interestingly enough, when initiating our researches on hill land I knew nothing of Mr. Allan's activities, and it is, therefore, of the greater significance that the methods we have subsequently developed in Wales have been based on the same general principle as the methods so successfully practised by Mr. Allan. I feel that the results independently achieved at Auchinleck add enormously to the strength of the case that can be made for the

improvement on an economic basis of rough and hill grazings. As in the past, so to-day the agricultural scientist has to be very wide awake if he is to keep pace with the advanced practices of thoughtful and enterprising farmers. The facts of agricultural science are almost always somewhere applied before they have been recognized or systematized, and before they have been generally accepted or made widely known—and thus Mr. Allan whom I gladly hail as pioneer where rough and hill grazings are concerned.

The estimates I have put forward in this chapter I think at least suggest that, in terms of the actual paddocks and areas improved, a period of fifteen years should be amply sufficient in which to have liquidated a sinking fund raised to meet only the expenses on the paddocks as such. A balance over and above what would be necessary in order to pay off *ad hoc* operation costs and to meet rent and shepherding would also appear to be in sight. If the jobs were contracted out and the phosphating exceptionally generous this balance might, however, amount to no more than, and possibly to not as much as, 10s. 6d. per acre per annum. This would be insufficient to contribute appreciably towards the land improver's income and administration charges and also to assist in the liquidation of a further sinking fund to provide for such items as the making of rough roads over the hills, erection of cheap additional accommodation for stock, re-organizing the sheep pens and the purchase of additional stock. It is exceedingly difficult to estimate such charges and to equate them fairly per acre of improved land. This much, however, is certain, that the amount necessary for such improvements will bear a fairly definite relation to the cost of *ad hoc* land improvement—when the one is high the other will be high. On the basis of what we have done on the Cahn Hill lands, and considering only absolute necessities, it is evident that the expenditure on general improvements and facilities under many circumstances could hardly be less than 6s. per acre of improved land, while for increased stocking a sum of £3 10s. per acre would probably be necessary. It would appear therefore that in the case of most of the improved areas it should be possible to write down the *ad hoc* charges on operations and facilities and to liquidate finally the sinking funds for these purposes during a period of fifteen

OVERHEAD CHARGES

years. Such a period would not be long enough in many instances also to have met the charges for increased stocking, and consequently any organized efforts at reclaiming the most difficult lands should aim at the provision of credit facilities lasting for nearly twenty years. It must be remembered that, after the initial improvements have been conducted, the outgoings on the land itself would only have to meet incremental phosphating, care of the sward and maintenance of fences, for all of which 6s. to 8s. per acre per annum would be a generous allowance.

CHAPTER XII

The Financial Aspects of Improving Outrun Fields on the Enclosed Farm Lands

Undertakings of Mr. S. M. Bligh and Captain R. T. Hinckes. Particular acts of land improvement. Does it pay to plough up an outrun field and re-grass it out? Botanical evidences and rent. Fences. Does it pay to rough-up, phosphate and sow wild white clover and other seeds? Implements. Does it pay to clear roughage and to remove surface water? Rushes. Mole drains. The reclamation of a sixty-eight-acre farm.

WE now have to approach an easier and much more immediately important set of problems than those presented by the unenclosed rough grazings. Most fortunately we have definite evidence as to costs and returns to draw upon, and, in addition, fairly reliable data to assist in the formulation of hypothetical cases. In the first place we have the detailed evidence of Mr. Bligh of Cilmerly Park, Breconshire, who has been land improving since 1908, and who, subsequent to 1915, has been adopting the methods outlined in my chapter on technique. The evolution of these methods, indeed, owes a very great deal to Mr. Bligh, with whom I have been in the closest association almost as long as I have studied grassland in Wales.

In addition, both my colleagues and I have had the benefit of collaboration with Captain R. T. Hinckes of Foxley, Hereford, who has been adopting similar methods subsequent to about 1930, and who since 1922 has re-conditioned several hundred acres of land on his estate in Herefordshire.

Finally, I am able to give interesting particulars in respect of a farm of 68 acres which is in process of being re-conditioned by a particularly enterprising owner-occupier.

The methods adopted in all cases have fallen into four categories, namely, clearing roughage—scrub, bracken, rushes, rough grass; carrying off surface water; roughing-up the

UNDERTAKINGS OF BLIGH AND HINCKES

derelict swards, phosphating and sowing wild white clover; ploughing out the sward and sowing down *de novo*.

Both Mr. Bligh and Captain Hinckes have kept accurate costs and records. Mr. Bligh all through has been able to estimate his returns in increased rentals—rentals of farms and of improved fields let by annual auction. In collaboration with Mr. Prewett, in the Oxford series of *Progress of English Farming Systems* Mr. Bligh has given a full account of the financial aspects of his improvements up to 1930. In general, and from the land-owner's point of view, a careful perusal of the report in which all the facts are set out in considerable detail shows definitely that the undertakings on the Cilmerly Estate have been profitable. These undertakings have not only included land improvement as such, but also provision of water where needed. The position as a whole is best indicated by quoting the closing paragraphs of the Bligh-Prewett report. They say (this was in 1930, and a number of advances in technique have been made since then) 'With a view to ascertaining the economic position independent valuation was made of the improved land, and this was assessed at £3,260 as against £1,790 before improvement was undertaken'. This after making certain necessary deductions shows 'a profit balance on the whole of £1,050'. They add: 'As a generalization rents have been raised from something under 4 per cent. to nearly 7 per cent. of the original land values where improvement has been carried out.'

Of greatest immediate interest, however, are the costs and achievements in respect of the various acts of land improvement as such. I will now revert to my previous method of endeavouring to answer a number of questions, and in doing so I shall draw on all the evidence at my disposal—not only on that from Mr. Bligh and Captain Hinckes.

Does it pay to plough up an outrun field and re-grass it out? I will first state the position in terms of the Cilmerly data and quote from the report as under:

								<i>Per acre</i>
'Clearing	-	-	-	-	-	-	-	£1 10 0
Ploughing and harrowing	-	-	-	-	-	-	-	2 8 0
Seeds	-	-	-	-	-	-	-	2 0 0
Phosphates	-	-	-	-	-	-	-	1 10 0
								<hr/> £7 8 0
Less profit on cover crop	-	-	-	-	-	-	-	1 8 0
Cost of ley	-	-	-	-	-	-	-	<hr/> £6 0 0

IMPROVING FARM LANDS : FINANCE

'It is assumed that the first year's autumn grazing covers the rent. The previous rental value of this land averages 6s. per acre; therefore £6 must be recovered.

'If one hay crop be taken, receipts work out as follows:

Hay year	-	-	-	-	-	-	-	£4	0	0
1st let	-	-	-	-	-	-	-	2	0	0
2nd let	-	-	-	-	-	-	-	1	15	0
3rd let	-	-	-	-	-	-	-	1	10	0
4th let	-	-	-	-	-	-	-	1	10	0
								<hr/>		
								£10	15	0
Less cost of ley	-	-	-	-	-	£6	0	0		
5 years' rent at 6s.	-	-	-	-	-	1	10	0		
								<hr/>		
								7	10	0
Profit	-	-	-	-	-	-	-	£3	5	0

'This represents the average experience on a number of fields of costs and returns over a period of fifteen years.

'Reploughing and reseeding of the ley is now necessary, this time with the object of making permanent grass. As there is no clearing, and the ground works better, the costs average:

Plough and harrowing	-	-	-	-	-	£2	0	0
Seeds	-	-	-	-	-	2	0	0
Phosphate	-	-	-	-	-	1	10	0
						<hr/>		
						£5	10	0
Profit on cover crop	-	-	-	-	-	1	10	0
						<hr/>		
Cost	-	-	-	-	-	£4	0	0

'As this second ley is to be permanent, a hay crop should not be taken, and £4 additional must be made from grazing. These second leys let at about 34s. from which 6s. original value must be deducted. The increased income is 28s. per year to write off £4 per acre, the cost of the ley. After 3½ years, therefore, the land is clear of all save the original rent of 6s.'

If the profit from the first ley (£3 5s.) had been used towards paying for the second, and allowing for the periods in which the field would have been put out of action in the preparation of the two leys, this would mean that the long lasting permanent sward would have been paid for within roughly 7½ years of first taking the field in hand. This on the basis of a clean write-off; if on the other hand, Mr. Bligh had wished to treat the original

BOTANICAL EVIDENCES AND RENT

rental (6s. per acre) as an interest debit to the operations account, it would take $8\frac{1}{2}$ to 9 years to have written down the improvement. On this showing, which would be more comparable with the examples given in the last chapter, the improvement by the same general procedure of the much more difficult land there dealt with does not by any means appear in an unfavourable financial light.

I must now examine the botanical evidence, and consider the whole question from the point of view of the latest developments in technique. All the fields ploughed out at Cilmerly were completely outrun. Some represented the poorest *Agrostis* pastures, others were practically fescue pastures, the fescue being even more abundant than the *Agrostis*. At the time of the first ploughings and seedings, wild white clover was available but exceedingly expensive, and was only sown in small amount, if at all, while the leafy persistent strains of the grasses were not then procurable. After the first ploughing, seeding and phosphating, the swards gradually and steadily deteriorated in the direction of their original bent-fescue or fescue-bent characteristics. After the second ploughing, further phosphating and including both leafy persistent perennial rye-grass and wild white clover in the mixtures, the swards are maintaining themselves in a remarkably satisfactory manner.

The whole set of changes have been followed up in detail by Mr. William Davies. The original swards have consisted of as much as 85 per cent. of fescue and bent with only traces of wild white clover. Such swards when ploughed up and sown down (with ordinary commercial seed) in no less than five to seven years have again become partially or completely dominated by bent and fescue. Thus in some cases these two grasses with Yorkshire fog (all unsown), have contributed from 60 per cent. to 86 per cent. to the sward. The wild white clover contribution at this stage has varied from 4 per cent. to 6 per cent., and that of the sown grasses has seldom exceeded 2 per cent. or at most 4 per cent. Evidence obtained four and seven years after the second ploughing, sowing (now with generous amounts of leafy perennial rye-grass and wild white clover) and phosphating reveals a sward consisting of 31 per cent. to 57 per cent. of sown grasses, with the leafy perennial rye-grass contributing as much as

27 per cent., and rough-stalked meadow grass and crested dogstail respectively up to 14 per cent. and 16 per cent., and a wild white clover contribution of from 9 per cent. to 11 per cent. The bent, fescue and Yorkshire fog have been reduced in some instances to an aggregate contribution of as little as 17 per cent., and have nowhere exceeded 55 per cent.

In terms of rentals, which may be taken as a rough measure of the farmer's reaction to these changes, the original bent-fescue pasture as shown by Mr. Bligh was assessed at 6s. per acre; the first new sward (without the leafy grasses and with little wild white clover) up to its fifth year at 30s. per acre; and the second and greatly improved sward at 34s. per acre. Several points arise. In the first place the final swards produced at Cilmerly (the result of increasing the seed rate of the leafy grasses and of wild white clover) have been much superior since 1930 to anything then available for letting. More important than this, however, is the question of what precisely the farmer pays rent for. In the first place, apart from position, convenience and access, he pays for air and exercise, somewhere to put the animals; then he pays for a bare maintenance ration. These two together are part and parcel of the rental paid for fields of every degree of productivity. Then he begins to pay for productivity. But what the farmer can afford to pay per unit of productivity is a function of three things in particular, firstly, the amount of the productivity; secondly, his mental alertness and ingenuity in dealing with productivity when he has it; and thirdly, his financial ability to follow in the wake of his mental alertness, if mentally alert he be. Greatly increased productivity per grassland acre brought into a district quite unaccustomed to the new standards may be disconcerting to landlord and farmer alike. The latter will have to learn new tricks before he can deal with what is offered to him, or with what he may have developed himself, in such a way as to remunerate either himself or his land-improving landowner in proportion to the productivity. Looked at from the point of view of individuals, and parochially, and as a short-range problem, this state of affairs constitutes a serious handicap to land improvement. If, however, land improvement and increased productivity all round were a matter of long-range State policy, the various parochial and individualistic

BOTANICAL EVIDENCES AND RENT

problems would automatically solve themselves. The new agriculture would have dawned!

By ploughing up and re-seeding (always with leafy perennial rye-grass and wild white clover) accompanied by generous phosphating, poor fescue pastures standing at elevations up to 700 ft. can be converted into really good rye-grass pastures. The process of ploughing up and re-seeding might be repeated at say six-yearly intervals over a total period of thirty years. In doing this the productive capacity of the land in live-weight increase would be raised enormously, from an initial 60-80 lb. per acre to a final 200-300 lb. per acre per annum. This would be attended with greatly increased potentialities for the wintering of stock. What does the farmer propose to do about it, and what would the State wish the farmer to do about it? That is the question. All the evidence combines to suggest that such a procedure would pay for itself handsomely and increasingly rapidly as it gained momentum.

The matter does not, however, end here, for it is perfectly obvious, at least to those of us who are engaged in work of this kind, that swards of a higher grade than the fescue pastures—say the moderately good *Agrostis* pastures standing at low elevations and up to about the 400 ft. contour—could be brought to the rye-grass standard at the first ploughing and first seeding out, and, with proper phosphating and attention, could be so maintained without further breaking for a considerable number of years. Since this type of *Agrostis* pasture contributes so heavily to our acreage under permanent grass and is widespread throughout the country, I think I need make no excuses for translating my available data (very considerable in the aggregate) in terms of a hypothetical case. I shall plough up my *Agrostis* pasture and sow it down under rape and Italian rye-grass as a nurse to my leafy rye-grass—wild white clover mixture forthwith. I am using horses (in Wales) and my operation costs in this instance, since ordinary farm fields only are involved, shall be those of the agricultural economist, kindly given to me by my friend Professor A. W. Ashby. The seed costs will be: nurse crop, 5 lb. rape and 6 lb. Italian rye-grass, say 5s. 6d., and for sward, 4 lb. wild white clover (at say 5s. per lb.); 25 lb. of Dr. Jenkin's leafy perennial rye-grass (at say 2s. per lb.) and 1½ lb. rough-stalked meadow

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grass (at say 2s. 3d. per lb.): total cost £3 13s. 4d. My manures shall be 1½ cwt. nitro-chalk (chiefly for the nurse crop) and 8 cwt. basic slag. In these terms the total cost of creating the long-duration sward will be:

							Per acre
Operation costs	-	-	-	-	-	-	£1 18 1
Seeds	-	-	-	-	-	-	3 18 10
Manures	-	-	-	-	-	-	2 1 3
Total per acre	-	-	-	-	-	-	£7 18 2

My aim has been to leave no stone unturned to ensure a first-class sward from the very outset; therefore, I have been generous with manures, and extremely generous with expensive seed. The tilth at the best will be rough, and weeds must be suppressed from the beginning—hence the heavy seed rates. I have also paid maximum prices for my seed, since there are some farmers who are always willing to do so.¹ I could buy excellent wild white clover at 4s. per lb., and even Dr. Jenkin's (Welsh Plant Breeding Station) perennial rye-grass is this year listed by some of the seed houses at 1s. 6d. per lb.—but some are asking 2s.

I estimate my incomings as follows: for the sake of convenience assume a Lady Day entry and a rental of £1 per acre. The field is ploughed up in April, and by August the rape and Italian rye-grass are ready to fatten lambs. I will ask no more of the rape and Italian rye-grass than I obtained on the Cahn Hill land at the 900 ft. contour—I estimated all my outgoings at their highest, and I shall estimate my incomings at their lowest, and therefore all through I shall only put 4½d. per lb. on my live weights. My lambs earn for me 35s. 3d. per acre. I want to graze the field at intervals through the winter and should certainly winter the equivalent of two or more sheep per acre—I will call it one and a half—and credit the field with 9s. I now come to my run of full summer grazings and, reverting to Chapter X, I can select live-weight increase figures from the various trials there described. I will be conservative and will content myself with a

¹I could have done the wild white clover in cleanings at about 8d. per lb. for about 10s., without introducing a single weed seed that really mattered, and I might have sown half my rye-grass in Dr. Jenkin's strain at 2s. per lb. and the other half in good cleanings from old Kentish pastures, and made my mixture cost no more than 40s.

BOTANICAL EVIDENCES AND RENT

performance of no more than 250 lb. live weight per annum, a return of £4 14s. Again I shall desire to winter sheep on the sward, but will content myself with crediting it with one such sheep at 6s. per acre. My incomings therefore are:

1st year	-	-	-	-	-	-	-	£2	4	3
2nd year	-	-	-	-	-	-	-	5	0	0
3rd year	-	-	-	-	-	-	-	5	0	0
Total for 3 years	-	-	-	-	-	-	-	£12	4	3

On this showing I should have paid my rent and cleared my costs in three years, with £1 6s. 1d. to the credit of the field to meet interest, shepherding and other overhead charges. I am perfectly aware that the field was earning something already, and if I wanted to pay off my costs on the difference it would, of course, take longer. Indeed, if the difference was only approximately 30s. per acre in favour of the improved sward, it would be necessary to run into the period of interim phosphating, when seven or eight years would have to elapse before the costs, which I have advisedly estimated at their absolute maximum, were fully written off. In practice it comes to this, that a man would not plough out a sward which already had a fair amount of rye-grass in it—he could do all the improvement necessary by good management and generous manuring. My ‘*Agrostis* pasture’, like the majority of such pastures, contained practically no rye-grass, and it is on such swards that we have gained so much experience—experience which points to the complete justification of the apparently extravagant procedure which my hypothetical case illustrates.

Both the theory and economics of these various methods of ploughing up and seeding down depend upon using wild white clover to build up fertility, and then establishing and maintaining a dominant rye-grass pasture. When an adequate standard of fertility has been reached, it is rye-grass rather than white clover that is wanted: the rye-grass : white-clover ratio then needs to be weighted in favour of rye-grass. The ratio is, however, peculiarly sensitive to management, and can be controlled at will by the farmer when once he has firmly established luxuriant rye-grass under conditions of adequate fertility. The necessity, and the justification on economic grounds, for

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ploughing up arises from the fact that, whereas wild white clover can be made to luxuriate on almost all situations by slagging—or by slagging, roughing-up and sowing the seed—there are thousands of acres of *Agrostis* pastures upon which the leafy perennial rye-grass can only be established by the dual method of building up fertility and sowing out on something akin to an arable tilth. On a few situations and where wild white clover is naturally abundant I have little doubt that the seed could be advantageously excluded from the mixture (at a corresponding saving in cost), when the seeding would consist only of leafy perennial rye-grass and say rough-stalked meadow grass. Only further trials and experience can show for each type of land which is the best policy, whether to start directly with the expensive long-duration mixture or to lead up to the end-stage with preliminary cheaper mixtures. Given good management, our experience suggests that a mixture strongly biased in the direction of the leafy and the more expensive will tend most quickly towards the paying off of costs, and this even if the first sward does not maintain itself as long as might have been hoped.

Captain Hinckes has adopted the various methods now under consideration on inferior lowland pastures and on rough bracken infested land at elevations between the 500 ft. and 800 ft. contours, sometimes sowing out direct and sometimes after cropping, and he has created greatly improved swards. Between 1926 and 1934 Captain Hinckes has increased his area under good lowland grass at the expense of inferior lowland grass to nearly three times the original acreage, while the acreage under rough land has been practically halved, and has more than doubled its carrying capacity. Captain Hinckes has kept his costs relatively low, spending about 33s. on seeds and 34s. on manures; wild white clover has been used from the start, and Dr. Jenkin's rye-grass is now being employed. Ploughing with a Fordson on rough land Captain Hinckes calculates at 8s. per acre, with which price the ploughing with the caterpillar at 9s. 1d.¹ on the much more difficult land of the Cahn Hill Improvement Scheme compares not unfavourably.

¹Exclusive of depreciation.

FENCES

In the case of the outrun fields, fences are often entirely broken down, so that this is an expense that frequently has to be met, although it may not always be necessary to fence the whole field. Mr. Bligh's average price for fencing (at 1s. per yard) has been £1 8s. 6d. per acre. He considers the fences should last twenty years, and he would put the cost for fencing and maintenance of fences at 3s. per annum per acre of productive (=improved) land. If we add the fencing charge (£1 8s. 6d.) to the operation and seeding costs of Mr. Bligh's fields considered at the beginning of this section, it would only mean one additional year for the writing down of the costs. These items—heavy if considered as current expenditure to be paid for as best they may be by a man with no resources behind him—recede further and further into the background if regarded and financed as a part of a long-range and ordered policy of land improvement.

Does it pay to rough-up, phosphate and sow wild white clover and other seeds on an outrun sward? Mr. Bligh has cited a case of about 25½ acres of rough grazing of a letting value of about 5s. per acre. In 1931, before Mr. Bligh took this land in hand, it was rough pasture consisting only of *Molinia* and *Nardus* with some Yorkshire fog and bent; it was devoid of crested dogstail and wild white clover. After roughing-up the surface and applying 6 cwt. to the acre of North African phosphates and sowing 1 cwt. to the acre of seed cleanings consisting chiefly of wild white clover and some dogstail, by 1933 *Molinia* and *Nardus* had been reduced to 3 per cent., the contribution of wild white clover was 34 per cent., the balance being made up chiefly of *Agrostis*, Yorkshire fog and crested dogstail. The fields so improved were then let off at 19s. per acre. Thus 14s. per acre gross increase in rental had followed on the improvements. This increase has to be divided between the cost of after treatment to keep the letting value up to 19s., and the writing off of the expenses of the original improvements, which cost £3 per acre.

The after treatments have consisted of bracken-cutting on part of the area and gutter-cutting on other parts; these operations, averaged over the whole area, would involve a clearance cost of 3s. per acre per annum, which would reduce the gross rental to a net rental of 11s. There would still remain the necessity for

replenishing phosphates, and this Mr. Bligh, backed by long experience, estimates at 3s. per acre per annum. The net rental, therefore, becomes 8s. per annum to write down the original outlay of 60s. I will complete the history of these highly instructive acres in Mr. Bligh's own suggestive sentences. He says 'This means that in $7\frac{1}{2}$ years from 1931 the treatment costs will be written off. The owner would then get a gross 19s. less original rent, 5s., and a treatment charge which would then be lower owing to the bracken being killed out, say in all 5s. an acre, that would be 9s. an acre.

'Approximately then, the land improver puts down £3 an acre, waits $7\frac{1}{2}$ years to get it back, and then has 9s. a year for an indefinite number of years. For those who can afford to wait $7\frac{1}{2}$ years the investment does not seem a bad one. It is comparable in some ways to Savings Certificates. If you capitalise the 9s. a year at five years' purchase when the $7\frac{1}{2}$ years run out you get 45s. on an outlay of 60s.

'But a great deal has to be paid in taxation, from which Savings Certificates are free. The risk is, of course, greater, being divided between the risk of a failure of "take" and the risk that prices of stock will keep low, and consequently the price of improved land will drop.'

Captain Hinckes has also roughed-up land following after the clearance of bracken. He has done excellent work with the Pitch-Pole harrow; he has also used disc harrows to obtain a seed bed on rough slopes which had been cleared of bracken. As a result of manuring friable hillside land with 6 cwt. basic slag, 10 cwt. ground lime and $1\frac{1}{2}$ cwt. nitro-chalk, and sowing wild white clover, leafy rye-grass and crested dogstail, he has already obtained noteworthy improvements—at costs per acre that should be written off no less quickly than in the case cited by Mr. Bligh.

Does it pay to clear roughage from outrun pastures and to remove surface water? The mistake too often made is to regard the cutting of bracken and rushes, the clearing of thorn and scrub, and the removal of roughage generally and of surface water as ends in themselves. They are not. To bear full fruit they should be respectively the first acts in an ordered policy of improvement. Take the case of bracken and gorse: to clear the latter may cost

DOES IT PAY TO CLEAR ROUGHAGE?

up to quite 30s. per acre, and in many cases to clear the former completely may cost nearly as much, for the cutting must be continued over a run of years, and to do so by hand, five times in all on Mr. Bligh's figures, would cost 26s. 6d. per acre. In my view, and speaking generally, when bracken is on places too steep or rocky for cutting to be done by a machine, such ground is best left to the forester, if he will accept it.

Captain Hinckes has done most successful and cheap bracken cutting on steep banks with the 'Hercules' mower drawn by a steady pair of horses; the Caterpillar tractor could, of course, negotiate as steep, or even steeper, slopes. On rough grazings (in which connection I did not deal with bracken because it is perhaps an even more urgent problem on enclosed fields) there are often, as I have previously shown, blocks of 50-100 acres together which could be tackled with the tractor and the 'Hercules'. There is this further and very important point about bracken areas. When the bracken is tall, thick and luxuriant, there will be a friable soil below and very little vegetation. Such areas should be roughed-up and phosphated at the first opportunity so that the sown wild white clover and grasses will encounter the minimum of competition with unwanted rubbish. I would cut the bracken twice in the first operation year, and rough-up, phosphate and sow in August.¹ The developing herbage will hold animals the following season, and they by their treading will be destructive to the bracken. In this, the second, season the bracken must be again cut, or the young fronds must be knocked about with a chain harrow or other suitable implement.

Where the bracken covering is not excessive, and a fairly dense sward lies below, it is better to have greatly reduced the bracken before roughing-up, phosphating and sowing. In either case the alternatives are the expenditure (over a run of years) of about 20s. to 30s. in all per acre on bracken elimination and the obtaining of but a poor maintenance pasture, which—of necessity not heavily stocked—would have a pronounced tendency to revert to bracken, or the expenditure of about 60s.-70s. over the same run of years (involving also roughing-up,

¹Alternatively the area may be roughed-up and sown in the following April, a procedure which would minimize the dangers of drought.

with 'reliability' tyres, and as I write I can see it now (a tractor without depreciation charges ticking up all the time) going at about fifteen miles an hour with a spring-tooth harrow behind it scratching grassland in terms of pence rather than of shillings per acre! During the summer of 1935 Mr. Bligh has topped over 100 acres of grassland with the Brenton thistle cutter attached to his car. This suggests the means of solving the problem of the cheap mow-over where it is chiefly bents and flower-heads that it is desired to remove.

Perhaps the most convincing evidence in relation to the costs and returns from the acts of land improvement is whether or not the land improver continues to conduct such operations over a number of years. Both Mr. Bligh and Captain Hinckes have so continued and are so continuing.

I will now refer to the case of Mr. Dan Lewis of Rhosfach, Upper Tumble, Carmarthenshire. In 1927 Mr. Lewis purchased his holding of 68 acres. The rental of the land would have been about 9s. per acre. The farm was in a derelict condition. The hedges were broken down, scrub having extended 10 to 20 ft. into some of the fields. The farm lies on heavy boulder clay at an elevation of about 400 ft. and is typical of much of the land in the Ammanford district previously discussed. When Mr. Lewis took over the farm 54 acres consisted of worthless *Molinia-Nardus* pasture, which was put to little or no use. Five acres were in poor *Agrostis*-Yorkshire fog pasture with excess of rushes. Six acres consisted of young temporary leys and three of arable.

By 1934 the area in *Molinia-Nardus* pasture had been reduced to 27 acres and the fields in *Agrostis*-Yorkshire fog had increased to 25 acres. Mr. Lewis had also created 7 acres of good long-duration ley (4-5 years) and two acres of good permanent grass with rye-grass. In 1927 he sold 1,040 lb. of butter equivalents off his farm; in 1934 his sales had increased to 1,805 lb. of butter equivalents. In 1927 his butter equivalent per cow was 173 lb.; by 1934 the figure had risen to 201 lb.

Until 1934 Mr. Lewis had adopted simple methods involving no great outlay. He has altogether spent about £10 on drainage, and another £20 on fences and the elimination of scrub. The fields were dealt with by heavy phosphating and cutting, followed by more intensive grazing and the use of farmyard manure

RECLAMATION OF A SIXTY-EIGHT ACRE FARM

as far as possible. By this means a large proportion of the worthless *Molinia-Nardus* pasture has been converted into tolerably good *Agrostis*-Yorkshire fog pasture, and, by further mowing-over, the rushes have been greatly reduced. For the rest Mr. Lewis has ploughed up, and after a course of cropping has sown down a small acreage into long-duration leys. The expenditure on phosphates up to 1934 had been £25, and on grass and clover seeds £12.

The aim has been to proceed step by step and gradually to bring the whole farm into a greatly improved condition. It is now necessary to increase the building facilities in order to make provision for a greatly increased head of stock and a much larger hay harvest. Having made the necessary extensions, it will be possible further to increase the phosphating, and to employ more drastic methods and more expensive seeds mixtures consisting of the leafy indigenous strains of grasses and clovers. This represents an exceedingly interesting case of patience and pertinacity, and of a land improver moving steadily forward towards the adoption of scientific methods in proportion as his facilities and his incomings render possible and justifiable increased expenditure on seeds, manures and implements. Mr. Lewis has contrived to sever the bonds of the vicious circle which strangles so many of the occupiers of farms on the poorest lands.

I think I can fairly sum up the case I have endeavoured to make in these technical and financial chapters as follows. That the productivity of our grasslands is capable of being enormously increased must be regarded as an established fact. In the case of the moderate swards—those which by some standards would be considered quite reasonably good—even considerable outlays to the order of £5-£7 per acre should be expected to write themselves off, including interest payments, within no more than five years, and then leave a legacy of greatly enhanced productivity. The much poorer, but not the poorest, grasslands should be able to write off outlays of the order of £7 per acre within no more than nine or so years, paying interest the while. The poorest of grasslands even on difficult and inaccessible ground should be able to meet outlays, including a repetition of operations, as great as £20 per acre, and write down all the field costs, including fences, within about fifteen years.

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In general, the smaller outlays, £1 to £3 per acre, do not necessarily write themselves off any more quickly than would the larger sums, nor do they give any greater assurance of ultimately doing so. Indeed in many instances the evidence suggests that to incur a large outlay from the start would be a sounder business proposition than to work for partial benefits from limited initial expenditure. The small man already encumbered and with no real working capital behind him, though anxious to improve his miserable grasslands, is compelled always to spend too little, to use too little slag or none at all, to use too little wild white clover or none at all, to leave the leafy grasses entirely out of his reckoning, and to tinker at improvements always on an insufficient initial outlay. The return per 20s. spent—and too frequently only dissipated—in this way is tragically small, and would bear no comparison with the returns that would follow on a scale of expenditure demanded by adequate methods properly conducted. Such is the finance of land improvement; the implications are obvious—and these I will pursue, up to a point, in my next chapter.

CHAPTER XIII

Financial Aspects: Credit Facilities

Re-conditioning of land; seeds, manures, drainage, fencing. Costs of land improvement; 'overheads', increase of stock. Long term credits; need of working capital for small farmers. Land improvement in Wales; necessary expenditure.

Land improvement in its most important aspect, namely, re-conditioning, begins with using better seeds and proceeds along a widening road to the use of phosphates where before they were not used, being generous where before one was cheese-paring, to clearing roughage, carrying off surface water, opening ditches, to roughing-up outworn surfaces, phosphating and sowing, and culminates in fencing, ploughing-up and the creation of high-class grass, or perhaps ultimately of arable.

The costs of re-conditioning, as I have said, will vary from about £3 per acre to perhaps as much as £20 per acre (spread over a number of years), and it may take fifteen or even more years to write down the necessary outlay. Land improvement, however, is for the future, and therefore twenty years is of no greater significance than two to a country with a restricted land surface.—provided that the costs are finally written off, and the improvements are real, lasting and profitable—that is the basis of my whole argument.

Every single act of land improvement makes demands upon the general overhead expenses of the farm—the work must be supervised and well thought out, more stock will have to be purchased, and the building facilities extended and improved.

I am not now concerned with the question of repairing dilapidated homesteads and farm buildings, but with such questions as re-arrangement and enlargement of sheep pens, dipping

baths and shearing sheds to cope with increased flocks. The erection of additional and cheap housing for cattle, the provision of cheap (wooden) silos, the purchase of land-improving implements, and the provision of track-roads (particularly in connection with the reclamation of hill land) have also to be taken into consideration. Some, and probably most, of the acts of land improvement while paying themselves off—during three- to fifteen-year periods—will also leave a sufficient margin of profit to contribute appreciably, or even generously, to ‘overheads’—some perhaps will not.

The land improver will have to increase his head of stock—to do so in most cases is of itself an act of land improvement—and he will have to extend his facilities in some direction or another. Expenditure will have to be faced both ‘about the place’ and on the fields from the very outset.

Land improvement is a complete impossibility, therefore, without long-term credit being at the disposal of the land improver. That is the beginning and end of the whole matter. On the basis of long-term credit, I believe the facts and the hypotheses founded on those facts which I have brought forward show land improvement in an entirely satisfactory light. The question will, of course, be asked—what about all the increased production and markets? Apart from that question being one of State policy, with which in this chapter I am not directly concerned, there is this very important—and not sufficiently realized—side to the whole problem. The average farmer on poor land, indeed the average grassland farmer, never has had at his disposal anything like adequate working capital; he has never had an opportunity, therefore, of really extending himself. I believe in general that if the British farmer were adequately supplied on rational terms with working capital—with long term credit in fact made available for the acts of husbandry and of improvements on his land—he would surprise himself and the country; his market is after all at his door, and, when once his facilities and improvements are in order, might he not compete on level terms with all comers? Land improvement is, of itself, a most stimulating enterprise; derelict acres are deadening alike to the soul of man and to the well-being of animals. A district agog with land improvement will be a district agog with enterprise in all

LONG TERM CREDITS

directions—has that been sufficiently realized? In these years of depression nowhere perhaps except in Italy.

Long-term credit! How long, and how much? I will take the case of Wales (including Monmouth), and I will put forward a well considered estimate. My estimate is based not only upon my own intimate knowledge of the lands of Wales; it is supported by the detailed knowledge of my colleagues Mr. Moses Griffith, Mr. William Davies and Mr. Trefor Thomas. More than this, it is an outcome of a careful examination of a large number of records in the possession of my Department, while on the cost side it is backed by all the experiments I have discussed in previous chapters and by the prolonged farming experiences of my well-informed co-workers.

I will deal first with the cultivated land (permanent grass and arable) of which there are over $2\frac{3}{4}$ million acres in Wales. My estimate for that most urgently demanding improvement, of a kind which could be effected comparatively easily and without any re-arrangement as to the size and orientation of the farms, is one million acres. I estimate the average cost per acre for the improvements (on the fields) at £4 10s.; a like sum per acre would be necessary for the purchase of extra stock, while an expenditure of 4s. an acre would be called for in respect of extra shedding, fencing, and the like. On this basis, in order both to improve and to get the best results from my million acres, an expenditure of £9,200,000 would be demanded.

The detailed records at my disposal show that of the rough and hill grazings (about $1\frac{3}{4}$ million acres in all) at least 600,000 acres are suitable for improvement. Under the present conditions of sheep farming, and having regard to the present orientation of the sheep farms, it would not, however, be feasible immediately to take in hand the whole of this acreage. To be conservative I propose to take half of this area, namely, 300,000 acres, as representing the amount of hill land that could with advantage be improved without delay. I estimate the average cost of improvements per acre (on the field) at £6; the amount demanded for increased stocking at £3 12s. 6d. per acre, and that for facilities (shedding, pens and tracks) at 6s. per acre. This would mean that for my hill land programme an expenditure of £2,890,000 would be necessary. In round figures to improve

FINANCIAL ASPECTS : CREDIT FACILITIES

the million acres of cultivated land and the 300,000 acres of rough grazings, and in order to utilize these lands to the best advantage, an expenditure of £12,000,000 would be called for.

So much for the amount of money necessary. For how long must it be made available? Since the after-management must be good, and the land improver must be maintained in an active and vigorous state of mind and health, it would be a fatal mistake to expect him to liquidate his sinking fund unduly rapidly. He should be allowed a sufficient number of years of the full benefit from his improvements and increased stocking before he is expected to free himself completely from his debt charges.

It will be realized that some of the improvements will pay themselves off much more quickly than others, and consequently if we were to allow as long as twenty years (which would be over-generous) for the final liquidation of all the loans in connection with my programme, the great majority of such loans would have been written down long before the lapse of that period. Moreover, since land improvement and the need for increased stocking is a gradual process, the whole twelve million pounds would not be called into use immediately, or before repayments had in fact begun.

It follows that if a fluid capital of twelve million pounds were placed at the disposal of Wales on the basis of a final repayment with interest at the end of twenty years, a programme considerably larger than that which I have postulated could be put through. This would be possible after allowing an ample margin for administrative and other charges in connection with the loan.

I must again emphasize that my programme has not taken into account the further need of improving either the existing farm houses or the existing farm buildings—I have only budgeted for such additions (in stock and facilities) as would be necessary in order to make the improved acres profitable.

Who will finance the agricultural resuscitation of Wales and in earning a profit in doing so also entirely revolutionize the outlook of the farmer, and bring order, tidiness, and progress where now there is only make-shift and steady decline? It is for those who know well the agricultural conditions of England to formulate the demands for England, and for those who know well their Scotland to do the same for Scotland.

CHAPTER XIV

Land Improvement and the Engineer

Land reclamation in Italy. Re-conditioning of land—a long-range programme. Agricultural Commission's Reports. Financial considerations of reclaiming land; conflict of interests. Need of creative enterprise. Estuaries; drainage and pumping. Salt marshes. The Land Drainage Acts. Responsibilities of Catchment Boards. Provision of washlands. The spirit and outlook of the engineer.

In this country no works of the magnitude of those undertaken in Italy or in Holland are in progress. The integral land improvement policy of Mussolini aims at creating agricultural land and a vigorous agricultural population where before there was nothing or practically nothing. To put through reclamation work of that order—the making of land, the erection of houses and buildings, the stamping out of disease, and the setting up of new agricultural communities—cannot fail to have a stimulating influence not only on all who are directly concerned, but also upon a nation as a whole. To turn land incapable of maintaining man or beast, or only capable of maintaining them in a state of poverty and ill-health, into productive and smiling acres is a creative act that stands to the credit of the nation with the heart to initiate such works not merely for decades but for hundreds, perhaps thousands, of years.¹

With reference to re-conditioning I have said that the matter must be approached on the basis of a sinking fund redeemable over a period of 15-20 years. Where engineering feats are

¹I had planned, in connection with writing this book, to visit the reclamation works in Italy and Holland, but unfortunately owing to lack of opportunity I had to abandon the idea, while I felt that it was more profitable to devote what little time I had available to hurried tours over the rough grazings and permanent pastures of this country. It is these latter which afford the really important problem here at home.

concerned and land to all intents and purposes is to be actually made, I question whether it is sound national policy to judge of the feasibility of a project solely in terms of the magnitude of the initial expense. Something will be done the benefit of which will last for centuries and gain momentum the while—and what could not be done if we think and act in terms of a capital expenditure based on sinking funds with liquidation periods running into hundreds of years? If the knowledge acquired by science in all directions is to be turned to the full use of mankind, mankind must find the means to organize productive enterprise on a gigantic scale and in all directions, either with or without the help of so-called wealth; either with, or in spite of, the various and sundry tokens that constitute money.

In my view, great acts of reclamation are absolutely necessary in this small country with its limited land area; they are necessary too for their influence on national morale and for their inspiring effect as a stimulant to research and enterprise, and incidentally they will afford employment in all manner of directions at a time when the problem of the unemployed has led almost to a state of morbid despair. Unnatural restriction and morbidity are inseparable alike in the inner consciousness of the individual and in the mass inner consciousness of a nation—and of that of the nations.

Does scope exist for the initiation of a policy of integral land reclamation in this country? Up to a certain point it undoubtedly does, though individually the areas would not be large and they would be scattered. The expense in relation to immediate benefits regarding some of the areas would by many no doubt be judged to be prohibitive. The Royal Commission on Coast Erosion, the Reclamation of Tidal Lands and Afforestation in their third (1911) Report were not able with much enthusiasm to advocate any large schemes of reclamation. They were able to show, however, that considerable areas of coastal and estuarine tidal lands could be reclaimed. At the time of the Commission's Report most of the projects brought under review were deemed to be too expensive, and did not appear to offer sufficient prospects of any immediate financial reward. Indeed the dominating consideration, as evinced by the attitude of the numerous witnesses as well as by the Commissioners

themselves, was necessarily finance and current land values. Naturally opinion and judgment were swayed by the current and short-term way of looking at long-term (historically long) problems. Nobody knows how much the Romans spent in money and labour initiating works on Romney Marsh and the Severn Estuary, but the equivalent of a colossal expenditure would by now have been justified and would have paid itself off. The paragraph which I quote hereunder from the Report, I think, illustrates exactly the frame of mind of the average person (the members of a Royal Commission in this instance) in relation to works which are intended to stand for periods of time beyond the reach of ordinary financial considerations. It will be noted that the Commissioners were by way of taking long views; they considered the future, but I can find no evidence in the Report that they gave any thought to posterity *qua* posterity. Here is the paragraph—the italics are mine. ‘Before considering these various localities, we would point out that reclamations are of a two-fold character, those executed for industrial purposes, such as the making of docks, railways, etc., and those devoted purely to the ends of agriculture. The former, as a rule, necessarily involve the expenditure of large sums of money, *and may ultimately produce considerable revenues*. The latter, though often costly, must rely for a return upon the agricultural value of the land reclaimed, which, of course, depends almost entirely upon its price at the period of reclamation. Thus land which even forty years ago fetched from £50 to £70 per acre, at the present time, in many instances, would not be worth half that sum in the agricultural market. The inference is that the reclamations which might have proved profitable in the past would now be a bad speculation, either for the State or for individuals. At the same time, there is nothing to show that in future altered conditions, which cannot be foreseen, *such land may not again show a greatly enhanced value*. This fact must be borne in mind in the consideration of the question. We wish to point out, therefore, that the exact values of land given by witnesses during the years of their experience of such land, do not definitely dispose of the question of the advisability or otherwise of the carrying out of reclamations which upon such evidence it might be thought should be dismissed as *unprofitable*.’

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Physical difficulties of an extraneous character and difficulties arising out of conflicting interests, rather than financial considerations, in many instances place almost insuperable obstacles in the way of reclaiming areas, which, on the face of it, might be taken in hand with great ultimate advantage to the nation. Thus in the case of Morecambe Bay any really effective scheme of reclamation would convert the seaside resorts along the coast into inland villages. Such a contingency has been boldly faced in Holland, and when reclamations in that country are completed, places such as Hoorn and Medemblik will be found some considerable distance from the seaboard. In many other cases the necessity of maintaining proper channels for navigation not only presents great difficulties but invites acute conflict between various interests. The failure to reclaim The Wash in accordance with expectation by the Company founded in 1846 has been to no inconsiderable extent due to necessary though extraneous statutory responsibilities and obligations placed on the Company.

The Wash, however, affords exceedingly difficult engineering problems, but problems which, given sufficient research and enterprise, would seem likely to yield to the resources of to-day. To embark upon the reclamation of The Wash in real earnest would undoubtedly be an act demanding long-sightedness of the historical sort and very considerable courage, and would also necessitate difficult negotiations with the interests concerned.

The launching of the scheme because difficult and demanding enterprise and courage and the carrying of it through to success would have far-reaching psychological influences and would stand for all time as a considerable national achievement.

To have put the work in hand as a something worth while in itself, and as a national monument, would have been an admirable way for the nation to celebrate the jubilee of a king who devotes himself courageously and unremittingly to the welfare of England. What could be so fitting as to create a little more England for such a king and his heirs to reign over?

To examine the reports of the various post-war committees and commissions is depressing reading. Sporadic endeavours have been made to consider means of finding work for the unemployed, perhaps a little more afforestation, a little reclamation, but always it is the *finding* and *making* of work. Surely on

NEED OF CREATIVE ENTERPRISE

every ground this is to put the cart before the horse, and to do the maximum amount of psychological harm to the unemployed. Great works should be undertaken for their own sakes, like the belated efforts in the direction of slum clearance, and because they are necessary, or will be stimulating, and if incidentally, as they needs must, they afford employment and much employment, so much the better. It is degrading for a man to feel he is working on a job that is only undertaken, and that grudgingly, in order to give him and his fellows employment. There can be no real gain and no lasting benefit when endeavour is stimulated by a sense of despair rather than by a spirit of creative enterprise.

Taking our estuaries as a whole, a number of fairly large areas occur which could be reclaimed, here by warping and there by drainage and pumping. Considerable acreages suitable for warping occur on the poor lands adjacent to the rivers Trent and Ouse, and there are perhaps one thousand acres of reclaimable land on the Essex Estuaries. The Royal Commission expressed the opinion that the possibilities of extensive reclamation of land in the Firth of Forth deserved close consideration and expert investigation. There are also innumerable smaller areas, some inland and some estuarine, that could be reclaimed—good examples are the Tregaron and Borth Bogs in Cardigan-shire.

An interesting secondary problem presents itself in connection with our estuaries, and that is the high grazing value of the salt marshes, which are capable of fattening stock and often earn rentals of up to £2 10s. to £3 per acre.

The salt marshes shade off into areas dominated by the sea rush when they cease to be of any value to the grazier. I have studied these transitory areas on Borth Bog, and on the estuary of the Taw and Torridge, and I believe it would often be possible by controlling and extending the flooding to convert the rush areas into good salt marsh. I cannot say whether to do this would demand expensive operations, but in the aggregate such areas are large, and the whole question is worthy of investigation. Equally worthy of investigation is the possibility of improving much estuarine land for grazing without resort to expensive defence or pumping works.

Perhaps the nearest approach this country has attained to the integral schemes of Mussolini was the passing of the Land Drainage Act of 1930. In our case we are endeavouring rather to safeguard what we possess than to create land anew. The Land Drainage Act has been responsible for the initiation and carrying through of a number of essential and long overdue works, and has had the great virtue of directing attention and inspiring action towards the solution of problems that can only be tackled with any hope of success on a regional basis. It is by that much 'integral' in conception, but would have been more 'integral' had drainage and water supply been linked together as the twin problems which in fact they are.

An interesting report (Triennial Report for the period ending October 1934) has recently been issued by the River Trent Catchment Board, and this gives some idea of both the magnitude and the importance of the responsibilities that devolve on the Drainage Boards. The River Trent Catchment Area is 2,578,539 acres in extent, and embraces Nottinghamshire, most of Leicestershire, Staffordshire, Derbyshire and parts of Lincolnshire, and the West Riding of Yorkshire. The need for controlling the flow of the rivers within the area is illustrated by the severe flood of 1932, when 150,000 acres were submerged, and the total area submerged or waterlogged was approximately 374,000 acres. The fact emerges that in the case of this Catchment Area it is impossible entirely to prevent flooding, for to accommodate the highest ascertained floods would require between two and three times the present river capacities. It follows that certain areas of land least subject to damage from flood must be selected for flooding and used as 'washlands'. The washlands will of course not be urban areas, the protection of which must always be the first care of the Board—so that farmers will usually have to pay for the protection that may be afforded to their more valuable acres by supplying the emergency washlands, which it is to be hoped in all cases will be chosen with due regard to the quality of agricultural land.

The technique employed in controlling the flow of the rivers is interesting and demands much scientific research, but is beyond the scope of this book to consider in detail. Two points, however, are worth noting: firstly, the part that modern

machinery and appliances have to play in dredging and other operations, and secondly, that diplomacy, perhaps even more than engineering skill, has to contribute to the success of the activities of the Board. The following paragraph quoted from the foreword to the report written by the Chairman of the Board is, I think, eloquent of the non-technical difficulties that have to be encountered—the kind of difficulties that have always to be encountered when in this country it is desired to put any long-sighted and worth-while improvements into operation. ‘I would like to accentuate what is said in the Report with reference to the constant aim of the Board to attain, and maintain, the friendliest relations with other “Main River” Authorities, such as Navigation and Fishery and Pollution Authorities, Water Supply Companies, and Local Authorities, large or small, Industrial concerns and others, concerned or connected in any way with the “Main River” of the Board. . . . I can see the possibility that the ultimate result of the Board’s “constant aim”, which I have accentuated, may be the realization, in due time, of the Ideal already attained by Father Thames and his Conservancy Board: One “Main River”, One Authority.’

The engineer has much to contribute, indeed almost everything to contribute, to reclamation and re-conditioning in general, and not only to the actual making of new land or to the protection of what has already been made. It is the spirit of the engineer that is required—the creative spirit. The point of view of men like Sanderson of Oundle, and the point of view elaborated by Korzybski should animate the nation’s endeavours, and in no respect more than in relation to the land—‘we live because we produce because we are acting in time and not merely acting in space . . . man must act first in order to be able to live’.

We want the very best engineering (in the broadest, widest meaning of the word) brains in the country to consider the problems of the land and reclamation. The whole question of implements suitable for the various acts demands extensive research. The operations of farming and reclamation are very different, yet all the methods I have described in previous chapters have been conducted with implements designed for the

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farmer; so far, therefore, the endeavours of the land improver have necessarily been halting and tentative.

The integral methods of Mussolini would perhaps, as I have said, be applicable on a limited scale to certain well selected areas of hill country. I mean the complete reclamation of considerable tracts of land, the building of homesteads and hamlets, the planting of shelter belts and the well considered provision of amenities. The spirit and outlook of the engineer must therefore be the motive force behind any such schemes if they are to be brought to successful fruition.

CHAPTER XV

Causes which Operate Against Land Improvement

The breaking up of estates. The effect of the industrial outlook and of industrial standards. Increase in owner-occupation; advantages and disadvantages. Restrictive covenants in leases; influence on systems of farming and on land improvement. Falling demand for wether mutton and mountain ponies. The importance of cattle. Incompatibility of farming and land improvement; the need of contractors. Grants in aid to the Agricultural Education Committees; demonstration contracts. Research and systems of farming.

Apart from world causes which unite to make food production unremunerative and apparently undesirable, there are a number of causes having nothing to do with the present morbid state of mankind that have long operated against land improvement in this country. The former causes are world wide and are matters for the statesman and the economist; the latter causes come more definitely within the self-imposed orbit of my book. They are material and psychological, and perhaps in most cases a kind of ill-conceived and rather mulish hybrid between the two, and, because mulish, difficult to counteract.

For many years this country has been in a state of unstable equilibrium in relation to agriculture and the land, and this has undoubtedly reacted against land improvement. The great estates have suffered on the one hand from modern excesses in taxation, and on the other—and perhaps to an even greater extent—from the increasing interests in many different directions that almost necessarily make calls on the time and energy of the landowning class; interests arising out of public spiritedness and a desire to take an active part in big business. Further modern opportunities and facilities for seeking enjoyment and

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relaxation elsewhere than at home and in the country operate in the same direction. This complete or partial divorce of the landowner from his land to a very real extent has been an outcome of altered standards in the estimate of human values, the direct result of the completeness of our industrialization. It took time for industrialization to create its own standards for assessing either the worth, the popularity or the magnificence of a man of wealth. At first, when large fortunes were being made, it was *via* landlordism and frequently *via* land improvement that wealthy men sought to place themselves in positions of importance and esteem. Later, and as the land in the eyes of the ever-growing town populations seemed to shrink in importance, purposeful association with the land ceased to be a method of either acquiring grace, popularity or affluence. The farmer and his produce became little better than pawns in the great game of finding, and the even more exciting game of manufacturing, world markets for the products of factory, mill and furnace. Land improvement and land reclamation were nobody's business in England, for it had become the Englishman's business to break-in virgin land, the financier by the length of his purse and the pioneer by his own labour, anywhere in the wide world except at home. These causes, both in themselves and considered psychologically, have been perhaps the most fundamental barriers to large-scale land improvement and reclamation that have operated in this country during recent decades. Although circumstances have now changed, the industrial outlook has gained such momentum that it has continued to carry the nation away from the land long after the brakes of altered world conditions have been applied. The germ of industrialization had also infected landowners and the more substantial farmers with its own particular symptoms—the desire to develop an export trade and a sense of acute rivalry. To an ever-increasing extent those landowners who maintained any sort of personal interest in agriculture vied with each other in the breeding of livestock. The show ring and the prices obtainable for pedigree beasts in the great ranching districts of the world became of keener interest than tiresome details connected with outlying farms, the encroachment of bracken, and the rapid deterioration of neglected acres. The bane of false standards, and the

THE BREAKING UP OF ESTATES

over-accentuation of particular standards, always insidious, began to influence the affairs of agriculture no less than the exploits of industry.

Some good, or at least great potential good, has followed from the changes that have been taking place, and particularly from the breaking up of estates. It is true that the farmer of to-day can but seldom fall back on his landlord to see him through a depression; but, as a set-off to his financial embarrassments and lack of working capital, the man who has become an owner-occupier has freed himself from the restrictive covenants inseparable from the dual control of land. The dual control of land by parties both of whom are in stringent financial circumstances undoubtedly reacts against the initiation of capital improvements even more than does control by a single person (the owner-occupier) devoid of resources. On the balance, the worst possible form of land tenure from the point of view of improvement and progress is when a man is the tenant of a landlord who owns but a single farm. Such small owners are seldom affluent, and but seldom have the interest of the land at heart. This type of occupation has increased enormously consequent upon the breaking up of estates. It is in considerable evidence in some districts in Wales, for example, and is almost invariably associated with dilapidated buildings and low standards of farming. The position in this respect is even more acute in the Lismore district of northern New South Wales where a large proportion of the farms are held by small (non-occupier) owners and the land is often held on yearly tenancy. This serves as a further example of the baneful influences of this form of tenure.

Just prior to the outbreak of the war it would seem that there was a tendency for the numbers of owner-occupiers in England and Wales to decline, although such a decline was probably not of equal incidence throughout the country. Since 1919 there has been a strong movement towards owner-occupation, and this has shown itself in respect of holdings of all sizes, but has been at its greatest in relation to farms of from 150-300 acres. It has been estimated that in 1913 only 10·7 per cent. of the area of farm land was owner-occupied; in 1921 the figure had risen to 20 per cent., and by 1927 it was actually as high as 36 per cent. Thus in 1927, 9,225,000 acres were farmed by men owning

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their land, the number of owner-occupiers having been trebled during the space of thirteen years, and now more than one-third of all the farmers of England and Wales are owner-occupiers. As far as I know, it is impossible to state with accuracy the extent to which the sitting tenants have been the purchasers of their holdings, but there is no doubt that in a very large proportion of the cases the transaction has taken this form.

Uncertainty of tenure, in my experience, has been a definite hindrance to land improvement, for this uncertainty has such a peculiarly strong psychological influence on the farmer. There is always the fear that on the death of even the most excellent landlord, and where an estate has been maintained in its entirety, the successor will adopt a different policy and sell off a proportion of the farms. When sales have once been initiated on an estate this uncertainty is greatly accentuated, while when an estate is obviously impoverished the general feeling of uncertainty is rendered acute.

It is perhaps surprising that despite everything such a large number of estates should have been maintained more or less intact, except in some cases for the sale of land for amenity or industrial purposes. It is a fact, however, that many large estates (upwards of 10,000 acres) have been sold in their entirety and completely broken up, the tenants purchasing the majority of the farms. I have information from a land agent friend of mine in charge of a number of estates in the west country (about 70,000 acres in all in 1890) showing that the sale of farms during 1919 and subsequently, in his agency, has amounted to 9,189 acres, and from 1897 to 1919 to 13,771 acres. In all, 155 farms of 25 acres and over have been sold—93 to the tenants and 62 to other purchasers.

On an estate of about 3,000 acres in Wales sold subsequently to 1919, ten of the farms were bought by the tenants and seven by other people. The extent to which agricultural land has changed hands in England and Wales in recent years is further indicated by the fact that over $1\frac{1}{4}$ million acres, or approximately one-twentieth of the total agricultural acreage of England and Wales, were disposed of in Messrs. Knight, Frank and Rutley's sales during the period 1913 to 1931.

The really important point to know is the extent to which the

INCREASE IN OWNER-OCCUPATION

tenants who have purchased their own farms are encumbered, and whether, on the balance, these men are farming better and maintaining their homesteads in a better or worse state of repair than when tenants. In this respect such information as I have been able to obtain indicates considerable differences from one locality to another. In some few districts, and more particularly where the farms are small and had not been maintained in good condition, it would be true to say that all the new owners are encumbered to the point of complete inefficiency and of despair. In other districts I am informed that the new yeomen are farming better than they did as tenants, and I know of several estates in respect of the sale of which not one of the purchasers has failed more or less to consolidate his position, and where none have fallen by the wayside. In the great majority of the cases which have come to my notice, however, the new owners are short of working capital, with the consequence that repairs to buildings are neglected, and it is only occasionally that real and drastic improvements to either the land or the equipment are being undertaken.

There is no doubt that the most serious aspect of the problem, from the owner-occupier's point of view, is not so much his inability to keep the farm in the most productive condition and the buildings in the most economical order during the period of the depression, but his lack of means to take advantage of a turn of the tide towards greater prosperity. It is frequently a matter of years before he can build up a sufficient reserve to get the buildings put into proper order, and to grow crops, or to rear stock in sufficient quantities to take advantage of better conditions. In this connection it must be borne in mind that the tenant who buys his farm has to provide an annual sum in excess of his quondam rent. He has to bear the tithe, land tax and similar out-goings, in addition to keeping his farm in repair, and carrying out improvements. This increase, allowing for repairs, maintenance and interest on purchase money, may range from about 23 per cent. to as much as 130 per cent.

The enquiries I have made have shown the great difficulty that landowners are experiencing in finding purchasers, or even tenants, for isolated hill farms, even though they are willing to let the farms at practically nominal rents. This I think is to be

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attributed not only to the isolation, although that counts for a very great deal with the present generation, but also to the fact that most of such farms have deteriorated sadly in recent years, while even at their best the homesteads and buildings of hill farms frequently leave much to be desired.

A cause of complaint on many small farms, and especially those near the industrial centres in South Wales, is the high rateable value put on the dwelling houses, and this, it is maintained, has offset the de-rating of the agricultural land and serves to maintain rent plus rates at too high a level. Rent in any event is very variable in relation to actualities and seems often to be influenced, sometimes in favour of the tenant and sometimes of the landowner, by conditions that are no longer operative.

In the long run, and although hard on the present generation of farmers, I believe the movement in the direction of increased owner-occupiers will be the salvation of our agriculture, for passive ownership (the absentee landlordism of recent decades) is no incentive to high farming and land improvement, while active ownership (the landlordism of the past, *e.g.* of the Knight family, and now of the owner-occupier and the few remaining actively interested landowners who manage and improve their own estates) is perhaps the strongest of all incentives to land improvement. I shall further elaborate this view in a subsequent chapter, when I shall argue in favour of a policy aiming at owner-occupation as the basis of land tenure and of non-encumbered yeomen farmers as the basis of a purposeful, robust and healthy countryside.

I have referred to the retarding influence of restrictive covenants in leases on land improvement, and to these may be added the influence of general usage and custom. Recent legislation (The Agricultural Holdings Acts) it is true has removed many of the uncertainties and injustices which operated to put a brake on the activities of the improving tenant, but he remains under the obligation of obtaining sanctions from his landlord in respect of most of the larger (and capital) acts of improvement (including additions to buildings) alike to lands and to buildings if he is to qualify for compensation at the end of the period of his tenure.

INFLUENCE ON SYSTEM OF FARMING

It is obvious that the improver cannot commit either his landlord or the incoming tenant to indefinite liabilities, but the obtaining of necessary sanctions is at best a fluky business, depending upon the finances of the estate, and too often upon the attitude of mind of the agent (to the passive landowner) towards new ideas and new methods.

Thus, although the tenant is safeguarded in the matter of compensation for normal and everyday acts of good husbandry, he is greatly restricted if he desires to reorganize entirely his system of farming, involving perhaps the breaking of permanent grassland, or, in the case of the hill man, adding to the size of his farm lands at the expense of his hill grazings.

The restrictive covenants relative to permanent grass constitute a definite obstacle in the way of grassland improvement. Even in the heart of the more famous permanent grass country there occur fields that could be vastly improved by ploughing and re-seeding, while the habits and practices (including restrictive clauses in leases) associated with typical districts always extend beyond the area to which in the main they are applicable.

It is not only that the plough has disappeared completely from whole districts and from many individual farms, but that it is looked at askance by landowners and their agents. This was serious enough in the best interests of the grassland before leafy and permanent strains of the grasses were procurable, but is doubly serious now that they are becoming available, and that the value of long-duration leys is more generally appreciated, and that the management of grassland is being planned on a more scientific and intensive basis. Apart altogether from grassland and land improvement, the whole position relative to rotations and systems of farming is to-day in such a state of flux and rapid change that hard and fast rules based on the outworn canons of good husbandry are not in sympathy with the times, and are liable to be serious handicaps to progress.

The incentive to land improvement is, of course, influenced to a marked degree by the demand for the products from land that could be improved. In the case of hill land and of the poorer grasslands in general (and these together constitute the great bulk of the improvable land in the country) three classes of

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animal (properly used) are of great importance, considered solely in relation to their influence on the pasturage. I refer to ponies, cattle and the old mountain wethers, all of which are at present unprofitable.

The old wethers act as policemen on the open grazings, for they tend to drive off trespassing sheep from neighbouring walks; they also shepherd the flocks during blizzards. The wethers are less fastidious grazers than the younger sheep, and there is little doubt that white grass (*Nardus stricta*) has increased on many bent-fescue swards, to the great detriment of such swards, as a consequence of the decreased population of this all-important class of sheep. The market for wether mutton has unfortunately dwindled to almost nothing, with the result that the tendency is inevitably to reduce the number of old wethers maintained on open sheep country below what is desirable in the interests alike of the flock as a whole and of the quality of the grazings.

Well-hung wether mutton is undoubtedly a real delicacy. It has probably gone out of fashion for the chief reason that the butchers have made no effort to maintain the supply and to keep it before the public. In these days of quick turnovers, prolonged 'lamb' season and cold storage, the careful hanging of whole carcasses (which is essential) entails the use of more space and gives more trouble in the matter of care and supervision than the butcher considers worth his while. There is no doubt also that the demand for wether mutton has been adversely influenced by the enormous increase in game coming on the market as a result of what has been nothing less than the industrialization of shooting as a sport. The modern generation, and I suppose the modern epicure—he still exists although his standards of quality and his scale of values are very different from those of his grandfather—hardly knows what wether mutton can be. He could, however, be taught, and I believe the trade in wether mutton could be resuscitated, despite the game and despite the generality of butchers. The commodity is excellent; all that is wanted, therefore, is specialistic marketing in well selected centres and a well organized advertising campaign.

The possibility of bringing cattle and ponies back to the hills in telling numbers—numbers sufficient to assist in the improvement

THE IMPORTANCE OF CATTLE

of the grazings and on a profitable basis—is problematical. The feasibility of doing so is dependent upon breaking the vicious circle which hems in the hill farmer at one point or another. To enhance the fertility-vegetation level of the grazings would constitute a formidable attack on the vicious circle. That on many hills would be of itself sufficient to substitute the summering of cobs for that of ponies.

There is undoubtedly a market for the right stamp of cob. A good sturdy cob is, for example, the proper animal to work hill land; cobs too are still in demand in and near towns for milk floats and vans. To achieve success in this direction much attention would, however, have to be given to breeding, for in recent times the character of the hackney has been to so large an extent superimposed on the cob, much to the detriment of the latter.

The only real hope for cattle is a complete recovery of the store trade on some permanent basis, not only the restoration of prices but some greater promise of stability in prices than even in times of reasonable prosperity has been associated with this essentially dealers' business.

There are grounds for optimism. The beef subsidy as earnest of the Government's intentions relative to the cattle industry and the licensing of bulls combine to give the rearer, no less than the feeder, a sporting chance. Will the rearer take it? He must first and foremost breed the type of animal the feeders require, and must maintain the necessary standard. It is true the open winters of Ireland are very favourable to the breeding of cattle, but it stands to the credit of the authorities in Ireland that they stamped out the scrub bull, and to the credit of the Irish farmers that they produced the type of stores the feeders required. It is up to the grassland farmers in the cattle-rearing districts in England and Wales to standardize their store animals and to improve their grasslands. They must make the combined attack—the threefold attack—on themselves, their cattle and their grasslands. The hill farmer, if he will improve his hill grazings and increase his winter feed on his farm lands, should be able to benefit from a restoration of the store trade, for in view of the immense value of cattle on sheep grazings he only needs a bare profit on his cattle in order to enable him to reap a greater

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return on his wool and mutton. Again, if the store trade were properly organized and resuscitated, the summering of cattle on the hills for the lowland and semi-lowland farmer would again become practical politics. Such farmers by summering on the hills could, of course, produce more hay on their farms for wintering—more hay or more silage.

The possibilities that would be opened up by any promise of recovery in the cattle industry are almost limitless, and would penetrate into the remotest homesteads in the country. The sum total of the results of any action taken in connection with agriculture is hard to estimate in terms of benefits or of harm done—benefits or harm to agriculture itself or to the nation at large, but the licensing of bulls and the beef subsidy may well prove a landmark in the history of British agriculture—the beginning of a more intensive and scientific movement in relation to the poorest grasslands of the country.

There are a number of causes inherent in farming that react against land improvement. The farmer usually has, or certainly thinks he has, enough to occupy his attention, and enough to occupy his staff without embarking upon extra work or looking for extra responsibilities. In many respects the acts of improvement are different from the acts of farming, and many of the former acts will perhaps clash with the harvest, the singling of the root breadth, or with some other essential process of husbandry. The acts of land improvement, like those of husbandry, must, however, in most cases be performed at the right and proper time if they are to be successful. This is true of bracken-cutting, rush-cutting and of mowing-over outrun pastures, to quote obvious examples. The man who means business in the matter of improving his land as opposed to just farming it should keep a minimum staff—of say one man and a team of horses—definitely assigned to improvement in contra-distinction to husbandry.

Much can be done by the farmer himself with his own resources, if only he can be persuaded to develop an eye for the business and to employ extra labour for the purpose. In order, however, to improve to the best advantage and on a telling scale, special, and in themselves costly, implements are frequently a necessity. Land improvement, I repeat, is a different and

THE NEED OF CONTRACTORS

distinct job from that of farming, and to a large extent it requires different implements, different tackle and rather a different attitude of mind.

I foresee a very great future for the contractor in all matters connected with the land. Without the intervention of the contractor, I cannot imagine how modern and expensive machinery is to be brought to bear on all the acts of husbandry, still less those of land improvement. At least, without the contractor in almost every district or without very close co-operation between the farmers themselves, I think there is a grave risk of the family farmer being slowly and steadily swallowed up by large and fully equipped farming companies, and this to my mind would be the greatest ill that could befall the countryside.

The contractor for many years has played a very large part in the arable districts, and it looks as if the replacement of steam tackle by the Gyrotiller will extend the scope of the contractor, and it may be extended even more by the advent of the combined harvester-thresher, and by plant for the drying of grass. The more specialistic farming becomes, and it is inevitable that it will become increasingly specialistic, the greater will be the need of specialistic jobs being performed by specialists. This applies to the use of lethal and in themselves dangerous chemicals for killing weeds and pests: special knowledge, special care and special plant are essential. There is already a tendency in the direction of the small man having too much capital tied up in implements but seldom used, and in this regard he cannot possibly compete with the big man; it is only the contractor who can come to his rescue, for primitive methods cannot long survive in competition with up-to-date and scientific methods.

The grassland farmer, and the half-grass half-arable farmer, if he is to be progressive and up-to-date, needs the help of the contractor as much, or nearly as much, as does the out and out arable man. The land improver is woefully limited if he is thrown wholly upon his own resources, and, as I have said, he will but seldom do the right thing at the right time, and he will for ever postpone the breaking-in of outrun fields.

The nucleus exists in every district: there is the haulage contractor ready to carry both live and dead stock, and also frequently the peripatetic threshing machine; or, most important

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of all, those who possess modern mechanical tackle (including tractors) for the removal and haulage of timber.

Let it once be fully realized that the plough, heavy tearing implements, the mole-drainer and the mowing machine are exceedingly important weapons in grassland districts, then the hired tractor with good implements behind it would be in great demand. A contractor equipped with a proper set of land improving implements and informed as to the technique appropriate to each situation in his particular district, and the job completed at a fixed price per acre—that is what the farmer would like. Apart from private enterprise there are a number of alternatives. The local Farmers' Co-operative Societies might well contemplate the advisability of feeling their way into the business. The local branches of the National Farmers' Union could do much to foster the idea of co-operation amongst farmers in this respect. The matter is, however, so important that I think the State should intervene.

I would advocate in the first instance the making of special grants to the Agricultural Education Committees of specified counties in relation to the type of land improvement most urgently called for. The Committees would purchase the necessary tackle, or, if more convenient, make the necessary arrangements with a contractor; and would do the work for farmers on the basis of what I would call 'demonstrational contracts'. The price charged should only include labour, fuel and lubricants. Depreciation and the cost of conveying the tackle from one farm to another would be borne by the Committee. The land of all farmers applying for the tackle would be inspected, the most suitable areas for improvement would be scheduled, and the holders of such farms would ballot for priority in the allocation of demonstrational contracts.

This procedure would be of high educational value. It would give the county education staff first-hand experience in land improvement—difficult experience to come by when no land improvement is in progress in a county. It would train mechanics and men in the art of land improvement. It would show the farmer how to improve his land. If all the above desiderata do not come within the terms of reference of the Agricultural Education Committees (already State-aided) then I do not

DEMONSTRATION CONTRACTS

know what is the purpose of such committees. The advantages of the 'demonstrational contract' go considerably further. Opportunities would be given for comparing costs under a wide range of conditions, and for estimating the degree of success under the various conditions. Most important of all, farmers would be brought to regard land improvement as coming within their own province, and they would be led in the direction of acquiring the contracting-out habit.

I should like to see this course adopted on a five-year plan. This would give long enough to ascertain the costs, to estimate both the results and the reaction of the farmers. At the end of this period, if the right atmosphere had been created and results of high promise obtained, there is no doubt at all that the tackle could with great advantage be sold cheaply to an individual, or to an organization sufficiently impressed by the prospects to start in the business of contracting.

To take as an example the tackle necessary for the improvement of hill land: a Caterpillar tractor, a lorry, an extra strong plough with high clearance, sundry heavy 'scratching' implements, manure and seed drills would involve a capital cost of about £1,500.

Five such outfits at work on the basis I have suggested from well chosen centres on the hill lands of England and Wales would not make a very serious inroad on the State allocation to agricultural education and research, and they would have the merit of leaving an extraordinarily tangible result behind them.

My view always has been that agricultural research means little to the farmer, and but little to the nation, unless it leads to the adoption of entirely new methods and practices. New methods and new practices can never be wholly worked out theoretically, the correct working plan must be evolved out of large scale trial and error. It is illogical for the State to sponsor agricultural research only to the extent of confusing the farmer with theory and with practices but half fledged. The scientist and the farmer must be assisted, and financially assisted, to unite together in the evolution of new rotations and new practices—it is only so that the nation will derive the full benefit from the money spent on agricultural research, and from all forms of State aid.

CHAPTER XVI

Supplies: Seeds and Manures

Importance of seeds, lime and manures. Seeds; estimate of needs. Wild white clover, leafy perennial rye-grass and cocksfoot. Methods of providing the seeds; outline of plan. Acreage demanded for seed production. Responsibility of plant-breeding stations. A seed-growing company. Seed-growers' associations. The individual farmer. Lime; estimate of needs, influence of road-making on price. Phosphatic manures; estimate of needs. Basic slag, rock phosphates and reinforced slags. The need of a detailed enquiry. The employment of labour.

ALL I have said in the earlier chapters relative to technique has been based on the assumption that supplies of the right kinds of seeds and manures were readily available. In fact, however, such supplies are not at present available in anything approaching to sufficient quantity to meet the calls of land improvement on a really considerable and national scale.

Seeds. The position as to seeds is by far the most urgent, for, in the case of many of the precise sorts required, the supply is not more than sufficient to meet fairly large scale experiments, and in practically all cases there is no organization in existence that would make it easy greatly to increase the amounts available. The static state of affairs as to seeds was rendered painfully apparent after the war, when the war-time ploughings were being put down to grass again on a wholesale scale. Wild white clover, because practically a monopoly and because no plans had been made greatly to increase supplies, was limited in amount and prohibitive in price. The immense significance of old-pasture indigenous perennial rye-grass had hardly begun to be appreciated, and consequently the seed was difficult to obtain and expensive. The only leafy cocksfoot available at that time was Akaroa (New Zealand) but the amount coming into the country

was almost negligible in comparison with the less efficient Danish. Rough-stalked meadow grass and crested dogstail, each of great usefulness on the lands to which they are appropriate, have always been relatively high priced, and neither is produced in the quantity that should be demanded. Immediately after the war the position as to strains of red clover was not realized in any purposeful way by either the generality of farmers or by most of the seed merchants. Unsuitable and foreign strains were employed, as they still too frequently are employed, in preference to the more suitable British strains.¹ As the result of all these causes a great opportunity was missed. Most of the ploughed areas went back to grass that soon became even poorer than before it was broken—with a little forethought and a little organization as to supplies of the correct seeds a fundamental improvement in thousands of acres of British grassland could have been effected.

This lesson should be sufficient to convince anybody possessed of a grain of foresight that an essential preliminary to any well conceived scheme of land improvement must be to safeguard the supplies of seeds—without the seeds every endeavour will fail.

To-day we know what seeds are wanted and, thanks to the plant breeder, we have the nucleus stocks available for building up the supplies; the organization for doing so must, however, be created, and created in advance of the large scale demand. Adequate supplies must be made available of at least wild white clover; the leading strains of late-flowering red clover (*e.g.* Montgomery extra-late and some of the best English lates); of indigenous leafy perennial rye-grass and cocksfoot and of rough-stalked meadow grass and crested dogstail. The absolute essentials are the wild white clover, leafy persistent perennial rye-grass and persistent cocksfoot. Not only should abundant supplies of these be assured, but the price of the seed to the farmer must be kept down to the very minimum.

¹It is true that the foreign strains are usually cheaper than the British, while it often happens that there is not sufficient British clover seed to meet normal demands. It is equally true, however, that no research worth mentioning has been devoted to the technique of seed production, which in this country has always been a happy-go-lucky and haphazard undertaking.

SUPPLIES : SEEDS AND MANURES

It will serve to emphasize the importance of the matter if we endeavour to form some opinion as to the amount of seed of these three strains that would be required for the purposes of a reasonable programme of land improvement.

I will confine myself to England and Wales, and estimate on the assumption of a ten-year programme made applicable alike to rough grazings, to permanent pasture, and to temporary leys sown down for four years and upwards. As to rough grazings, I will assume that 1 per cent. per annum of the total acreage will be sown with 2 lb. per acre of wild white clover,¹ that 0.5 per cent. will be sown per annum with pedigree perennial rye-grass (S.23 of the Welsh Plant Breeding Station) at 20 lb. per acre, and that a like acreage will be sown with pedigree cocksfoot (S.26 of the Welsh Plant Breeding Station) at 15 lb. per acre.

I will assume that during the ten years 20 per cent. of the permanent grass of England and Wales will be ploughed up and re-seeded out—this would mean a ploughing-up campaign at the rate of 2 per cent. of the total acreage of permanent grass per annum, or, 300,000 acres to be sown down each year. The seed rates would be wild white clover 1 lb. per acre; perennial rye-grass (S.23) 20 lb. per acre, and cocksfoot (S.26) 5 lb. per acre.

After a careful consideration of the acreage in temporary grass for each county in England and Wales, and the average duration of the leys, I have come to the conclusion that a conservative estimate for the acreage sown down each year in leys to be left down for four years and upwards would be about one-eighth of the total scheduled as temporary grass. This gives us 309,000 acres to be sown annually with a mixture demanding *inter alia* per acre 1 lb. of wild white clover, 18 lb. of perennial rye-grass (S.23) and 5 lb. of cocksfoot (S.26).²

I have made the necessary calculations as to the seed

¹This would imply the improvement of 10 per cent. of the rough grazings in ten years—at least 20 per cent. in all should be improved during the next twenty or so years.

²This is an estimate of seed requirements: cocksfoot would in practice be excluded from some mixtures and included in others in much greater quantities.

OUTLINE OF PLAN

requirements per annum in order to implement my programme, and the figures are set out in the statement hereunder:

ANNUAL SEED REQUIREMENTS IN TONS OF WILD WHITE CLOVER, PERENNIAL RYE-GRASS (S.23) AND COCKSFOOT (S.26) FOR ROUGH GRAZINGS, PERMANENT PASTURE AND LONG LEYS (FOUR YEARS AND UPWARDS)

	Wild white clover	Perennial rye-grass (S.23)	Cocksfoot (S.26)
	Tons	Tons	Tons
Rough grazings -	44.7	223.5	167.5
Permanent pastures -	134.1	2682.0	670.5
Long leys - - -	138.0	2490.0	690.0
Total -	316.8	5395.5	1528.0
Commuted to whole numbers - -	317	5396	1528

Thus, in all, 7,240 tons of seeds would have to be grown and harvested per annum in order to put through my very modest programme of land improvement. A similar, or practically similar, programme could advantageously be carried out for at least a further ten-year period, while the seeds called for per annum for the long leys should be required indefinitely; also it is probable that most of the permanent pasture which had been re-seeded would come to be maintained in long-duration leys—this also indefinitely. It is probable that the annual production of wild white clover to-day does not much exceed 200 tons; it follows that the supply should be more than doubled and this can only be done by organized seed production. The leafy rye-grass and cocksfoot sown on the temporary leys would replace by that much the ordinary commercial strains emanating chiefly from Ireland and Denmark respectively. The rye-grasses and cocksfoot sowings on the permanent pastures and rough grazings would be wholly additional to anything sown at present.

I will now consider the ways and means of producing the seed. All grassland seeds have this in common, that they are cross-fertilized, and therefore one strain of a particular species (*e.g.*, pedigree perennial rye-grass) is liable to be contaminated by a different strain (*e.g.*, ordinary commercial rye-grass) of

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the same species. Reasonable precautions have therefore to be taken in the production of seed, and this is of particular importance relative to the stocks of seed which will be used to grow the bulk supplies. In regard to growing the bulk supplies two matters in particular are urgent. The growing-on areas should be in large units—this safeguards isolation—and only 'authenticated' seeds should be used for seed production.

The great advantage of the plant breeder's strains is this: they are comparatively, or sometimes even completely, genetically pure. They are altogether more pure than the regional strains—strains like wild white clover, Montgomery red clover and Kentish indigenous perennial rye-grass, for example. A pure strain (in the genetical sense) can be grown-on away from its normal surroundings (*e.g.*, under arable conditions, or in a different locality from that in which it was produced or to which it normally appertains) without much risk of deterioration. This is far from necessarily true in respect of a regional strain. Here is the great difference between the best Kentish indigenous rye-grass (the seed that is in fact taken from old permanent pastures) and a pedigree, leafy, persistent strain with a high genetical purity. The only really reliable Kentish rye-grass is that actually taken from the old permanent pastures—and this at the best can only be a very small annual supply. To even once-grow this seed is to invite serious deterioration—to grow-on again and again is to make a certainty of deterioration.¹ Adequate supplies of leafy persistent perennial rye-grass can, therefore, only be maintained by the organized seed production of a pedigree leafy strain which will not deteriorate under a limited system of growing-on.

The ordered procedure should be as follows. The plant breeding station responsible for the production of the strains (leafy perennial rye-grass and cocksfoot in the case we are discussing) should also have the responsibility for producing a sufficient annual supply of 'stock seed'. This 'stock seed' will be sown (once-grown) to produce a further crop—the 'authenticated

¹When the seed is sown to produce a seed crop, in the year of harvest the earlier and less persistent elements will tend to predominate over the later and more persistent elements, so that a tendency in the wrong direction is immediately favoured and, if the process is continued, becomes rapidly cumulative.

ACREAGE DEMANDED FOR SEED PRODUCTION

seed'. The 'authenticated seed' will be that which will produce the 'bulk seed' to be ultimately retailed to the farmers.

In this sequence it is absolutely essential that the plant breeding stations should maintain their own seed production farms. On these farms the 'stock seed' would be grown and, in cases where the ultimate demands were not unduly heavy, 'authenticated seed' might also be produced. Seed production farms under scientific control are also essential in order that the intricate problems of seed growing can be properly studied. Such farms would also serve as demonstration centres for the benefit of those producing 'bulk seed'.

In a case like that of the leafy perennial rye-grass the amount of 'authenticated seed' required might be beyond the capacity of the seed production farm. In this event two alternatives would be possible. Contracts might be placed with neighbouring farmers, when the seed would be grown under the supervision of the plant breeding station concerned. Or particular seed growers' associations or particular seed firms might be authorized to grow the 'authenticated seed'—under the supervision of the institution which had produced the strain in question.

A system of certification would safeguard the 'bulk' supplies. Only seed grown from 'authenticated seed' would be eligible for certification. It would be open to anybody to grow bulk seed, provided always that it was produced only from 'authenticated seed', but in order to produce 'certified bulk seed' each grower would have to be subject to inspection, and comply with a few simple rules and regulations.

In brief outline some such procedure as this must form the basis of any organization that is to be contemplated. I am, however, very averse to the setting up of elaborate machinery involving excess of inspection and a multitude of rules and regulations—all of which must necessarily add to the ultimate cost of the seed to the farmer.

If the purity of the 'authenticated seed' is abundantly taken care of no great harm can come to the 'bulk seed.' In the last resort all rules and regulations can be circumvented—and in the last resort every trade has to adapt its practices to the inexorable dictates of modern tendencies. So true is this (and since, too, most of the really valuable pedigree strains are fairly easily

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recognizable) that I am not at all sure that I would not myself be willing to concentrate only upon safeguarding the supplies of 'authenticated seed' and dispense with any attempt at controlling (by certification) the fate of the 'bulk seed'.

Having outlined the procedure (and the procedure would be precisely the same for pedigree leafy strains of timothy and all the other valuable grasses and clovers) let us see how matters stand in respect of producing the necessary bulks of the wild white clover, perennial rye-grass (S.23) and cocksfoot (S.26).

I will assume that the wild white clover, like the rye-grass and cocksfoot, will be produced in terms of a new and pedigree strain,¹ and in my calculations I have adopted the seed rates employed at the Welsh Plant Breeding Station for seed production, and have further worked on the basis of the average yields of seed per acre which we have obtained during the past five or six years. I have adopted conservative figures throughout and the results of my calculations are detailed in the three statements hereunder:

SEED MULTIPLICATION FACTORS

	Stock Seed	Authenticated Seed	Bulk Seed
Wild white clover -	1	15.0	225
Perennial rye-grass (S.23) -	1	66.6	887
Cocksfoot (S.26) -	1	80.0	6400

SEED PRODUCTION: TONS

Seed required at each stage in multiplication to produce bulk seed as per totals demanded per annum for my ten-year programme.

	Stock Seed	Authenticated Seed	Bulk Seed
Wild white clover -	1.41	21.1	317
Perennial rye-grass (S.23) -	6.08	405.0	5396
Cocksfoot (S.26) -	0.24	19.1	1527
Total tons -	7.73	445.2	7240

¹Plant breeding is proceeding rapidly with wild white clover, and improved strains are already available.



Left: Cocksfoot after harvest
Right: Timothy ready for harvest



Perennial Rye-grass in stooks
 Seed crops of Welsh Plant Breeding Station
 Pedigree strains in Montgomeryshire

RESPONSIBILITY OF PLANT BREEDING STATIONS

SEED PRODUCTION: ACRES.

Acres required at each stage in multiplication to produce bulk seed as per totals demanded per annum for my ten-year programme.

	Stock Seed	Authenticated Seed	Bulk Seed
Wild white clover -	42.20	633.0	9.495
Perennial rye-grass (S.23) -	40.90	2725.0	36.300
Cocksfoot (S.26) -	1.34	107.2	8.576
Total acres -	84.44	3465.2	54.371

The crux of the whole matter is revealed by the acreage figures given in the final statement. From this statement it would appear that if the responsible plant breeding station were charged with the production of both the 'stock seed' and the 'authenticated seed' demanded by my ten-year programme, the area harvested per annum (for the white clover, rye-grass and cocksfoot) would amount to 3,550 acres. In order to maintain this acreage in harvest every year from a well planned sequence of seed crops, and with a view to working on the basis of an adequate rotation, a farm (or farms) giving 5,800 acres of arable land would be necessary. Such an area of land suitable for rotation would certainly carry with it an appreciable area in permanent grass. If we assume 10 per cent. as being in grass or otherwise unsuited to the plough, it would be necessary to acquire some 6,500 acres for our seed farms.

A certain proportion of permanent grass would be desirable with reference to keeping working horses and some stock; the latter are essential to the proper organization of a seed farm. In order to maintain fertility, red clover would be brought into the rotation, while a cereal (*e.g.*, oats) could conveniently be grown. Both the red clover and the oats would be treated as seed crops; and without increasing the acreage necessary for the *ad hoc* requirements under discussion, they would add to the yearly revenue from the sale of seeds.

The total acreage in seed crops, including 'stockseed,' 'authenticated seed' and 'bulk seed', each year would amount to no more

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than 58,000 acres. It is therefore evident that the amount of organization necessary to produce the seed required should not present any great difficulties, and the more so as the experience already gained shows that the production of grassland seeds is possible in the majority of the counties of England, and in several of the Welsh counties also.

There is no doubt that the ideal arrangement would be for an *ad hoc* company, backed by necessary State sanctions, to be established and made responsible for the whole business of producing the bulk seed of the specialistic and pedigree strains of grasses and clovers, and for marketing the seed as produced through the ordinary wholesale channels. The plant breeding agencies, whether State-aided plant breeding stations or individual firms, would receive some agreed royalty on the sales of their productions. I was once optimistic enough to think that the British seed trade would found such a company for itself—but the seed trade thinks in too many tones and speaks in too many voices to take complete charge of its own destiny in quite such a purposeful manner as the founding of a growing-on company would imply.

If proper arrangements could be made for the production of 'authenticated seed' I think we might be able to do fairly well without the company for the production of 'bulk seed'. Much more would, however, have to be done to promote well organized seed growers' associations of farmers. Up to the present, such associations have been formed to grow and market a single regional strain—the Montgomery Association for the Montgomery extra-late red clover, the Cornish Marl Association for the red clover of that name, and the Essex Association for the Essex strains of red clover. Each of these associations should also grow a special (and pedigree) strain of grass—a cocksfoot, a rye-grass and a timothy, for example, and there is room for more associations, and this will be increasingly so in proportion as the plant breeder produces more and better strains. Individual farmers might also consider the advisability of growing their own stocks of 'bulk seed', or at least small groups of farmers in a district might co-operate to this end. One farmer would grow the rye-grass for himself and his neighbours; another the cocksfoot, and another the white clover, and so on.

SEED GROWERS' ASSOCIATIONS

Even without co-operation, and without a central growing-on company, the seed trade could do a great deal more than at present. Individual firms have, however, already taken the matter up in respect of the pedigree strains of the Welsh Plant Breeding Station. At present there is no control as to price or as to certification, so that we have an interesting experiment in private enterprise and trade integrity. Perhaps the greatest loophole for malpractices is the fact that no official roll exists of the actual firms who have in fact purchased 'authenticated seed' from the Welsh Plant Breeding Station and of those who are actually producing 'bulk seed'. The procedure up to the present has been based on an almost sublime faith in the goodwill of mankind—and I am bound to say I always think that it is a sad mistake that more experiments are not conducted on this basis. A hearty rivalry between the trade, the seed growers' associations and individual farmers will tend to keep all parties concerned up to the mark, and is likely also to have a healthy influence on the ultimate retail price of the seeds.

At least it can be said that a beginning has been made. Improved strains of grassland plants, the seed of which is being grown at home, is filtering through to farmers—as yet at too high a price and in wholly inadequate quantities—but the snowball has been started. Around this snowball the necessary organization will evolve, although no doubt in a delightfully haphazard and truly British manner. Seed production as such, when the snowball has grown full circle, will constitute no mean—although always a localized—addition to the cash crops available to the British farmer; if he grows under contract for a seed merchant, the cash is there just the same.

The fact is already appreciated by individual farmers in Montgomeryshire and over the Herefordshire and Shropshire borders, and by those in Essex who have been growing 'authenticated' and (or) 'bulk seed' on a contract basis for the Welsh Plant Breeding Station, and for some of the larger seed firms. It is a fact well realized too by grassland seed producers in many parts of New Zealand.

Lime. I have previously referred to lime deficiency, and have emphasized the importance of lime in connection with land improvement. I have discussed the matter with numerous

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authorities in different parts of the country, and I have little doubt that it would be a conservative estimate to state that 50 per cent. of the farmlands (arable and permanent grass) of England and Wales are in serious need of lime. A dressing of one ton of burnt lime to the acre would be little enough to rectify matters. Even so, if an endeavour were made to organize a lime campaign on this basis, and over a ten-year period, it would necessitate the quarrying, distribution and spreading of an extra 1,375,000 tons of burnt lime per annum. I have advisedly left the rough grazings out of account, not because lime is not needed in connection with their reclamation, but because for the time being there is so much that can be done by resort to phosphates only, and because the case of the farmlands is the more immediately urgent.

The distribution of lime could be greatly assisted by State intervention; grants might be made to the railway companies with a view to reducing the freight charges to the farmer. The cost of agricultural lime is, however, always to a large extent a function of the amount of limestone required for road metal and other purposes.

If the care of the main roads throughout the country was made the charge of a single authority, the provision of road metal (including binding and facing material) and of lime for agriculture could probably be organized on a comprehensive basis with a consequent reduction of prices all round. One of the difficulties standing in the way of excessively cheap lime for agriculture is the short season during which farmers are generally able or willing to apply lime. In connection with reclamation the actual date of application is frequently of little significance, and if an organization could be created for the delivery and spreading of lime at cut rates the lime season could be greatly extended, and the use of lime enormously increased. A road authority and a liming authority working in close collaboration would seem to be urgently needed if the lime-hunger of so much of our agricultural land is to be appeased.

I have discussed this question with representatives of a number of lime firms, and it is interesting to be able to state that the idea of contracting for delivery (to the field) and spreading has received serious consideration, and has actually been put into

PHOSPHATIC MANURES : ESTIMATE OF NEEDS

practice in the case of one firm in so far as farms situated reasonably close to the quarries are concerned. With modern transport facilities and modern distributors it would not be difficult to organize a lime campaign on a regional basis, and in relation to the geographical distribution of the quarries.

Phosphatic Manures. It is exceedingly difficult to compute what the total consumption of phosphatic manures on our grasslands ought to be, because we have no completely reliable means of ascertaining how much phosphates are used upon them already. For all practical purposes we can be sure that the amount of phosphates used on the rough and hill grazings is negligible. If we take as our programme the improvement of 10 per cent. of the rough grazings of England and Wales during a ten-year period, and assume an application equivalent to 10 cwt. slag (15 per cent. P_2O_5) per acre, this would entail the use of 3,750 tons of P_2O_5 or 25,000 tons of slag (15 per cent. P_2O_5) per annum—which would be wholly extra to the slag consumption of England and Wales to-day.

In so far as the permanent pastures of England and Wales are concerned, and having regard to such acreage as only receives insufficient phosphatic manures, I do not think it would be an over statement to say that the equivalent of 75 per cent. of the permanent pastures of England and Wales are not receiving phosphatic manures. That the percentage is indeed as high as this would seem to be borne out by such evidence as exists relative to the total consumption of phosphatic manures in Great Britain and Northern Ireland. The average total consumption per annum is of the order of 150,000 metric tons of P_2O_5 .¹ If we assume that of this total England and Wales consume two-thirds (= 100,000 metric tons of P_2O_5), and realizing that most of the superphosphates and a good deal of 'other phosphates' (bone residues) will be used in horticulture and in arable farming, I do not think that we could fairly allocate more than 30,000 metric tons of P_2O_5 to the permanent grasslands of England and Wales as representing the normal application per annum. If then we definitely assume that the equivalent of 75 per cent. of the acreage of the permanent grass in England and Wales

¹It is probable that in the last few years the consumption has been appreciably higher than this.

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is phosphate-hungry, and if we desire to rectify this hunger over a ten-year period, it would be necessary to apply say 10 cwt. slag (15 per cent. P_2O_5) per acre to $7\frac{1}{2}$ per cent. of the total area of permanent grass per annum.

In the statement hereunder I have set out approximately and in round figures the additional phosphates that would be called for per annum (wholly over and above those at present used on permanent grass—30,000 tons P_2O_5 —and on arable) in order to fulfil my ten-year programme in respect both of rough grazings and permanent pastures.

ANNUAL ADDITIONAL PHOSPHATE REQUIREMENTS

In order to apply the equivalent of 10 cwt. basic slag (15 per cent. P_2O_5) per acre to 75 per cent. of the permanent grasslands of England and Wales, and to 10 per cent. of the rough grazings during a period of ten years.

	As P_2O_5 Tons	As slag (15 per cent. P_2O_5) Tons	As rock phosphate (26 per cent. P_2O_5) Tons	As mixture slag 2: rock phosphate 1	
				Slag Tons	Rock phosphate Tons
Permanent pasture	82,500	550,000	318,000	294,000	147,000
Rough grazings -	3,750	25,000	14,400	13,400	6,700
Totals -	86,250	575,000	332,400	307,400	153,700

In terms of basic slag my budget (575,000 tons per annum) is excessive, and could not be met even if the steel trade (of which basic slag is a by-product) were to flourish quite unexpectedly. Resort in very large measure would therefore have to be made to rock phosphates, which are available in practically unlimited quantity. This raises the question of reinforced slags (mixture of basic slag and rock phosphates) as well as of the value of rock phosphates as such. Unfortunately rock phosphates have not been sufficiently experimented with, as there is no central organization to foster sales and inspire research, while the extended use of reinforced slags would raise difficult legal and analytical issues in relation to the Fertilizers and Feeding Stuff Act, as well as set a number of baffling technical problems

BASIC SLAG, ROCK PHOSPHATE, REINFORCED SLAG

to the agronomist and chemist. As far as my own experiments have gone it would seem, however, that reinforced slags are of very real value in connection with the improvement of rough grazings on acid soils, while over large areas in Britain rock phosphates (alone) have definitely proved their worth. The point that I wish to stress is that an abundant supply of phosphates is a fundamental pre-requisite to a campaign of land improvement, and consequently there is need of a detailed enquiry relative to the whole position. The potential demand for phosphates can only be met by a greatly extended use of rock phosphates—How and where and under what precise conditions of application can these phosphates be used to the best advantage? That is the crucial point to be decided.

I have outlined only a humble seed, lime and phosphate campaign, but it is a campaign which, if put into operation, would have far-reaching effects, and would immediately employ a considerable amount of labour in a number of spheres—quarrying and grinding lime; shipping, grinding and bagging rock phosphates; grinding and mixing slags and phosphates; freight on the railways; transport by lorry; work on the fields; and intensified arable farming for the production of seeds. Without such a campaign it is idle to talk or think of land improvement on anything approaching a telling scale.

CHAPTER XVII

Rural Facilities

Rural housing and farm buildings; ventilation and convenience. Rural water supply for houses, buildings and fields. Methods of providing water. Isolation of hill farms and shepherds' cottages. Rural telephone services. Roads and tracks; need of greatly increased facilities. Village clubs.

A progressive attitude and the adoption of modern methods are perhaps not to be expected unless the rural community is provided with adequate facilities. The state of the farm-houses, farm buildings and cottages varies to an extraordinary extent from district to district, and from estate to estate. Many estates for years have adopted an extravagant repair policy—an unwillingness, for example, to replace broken pantiles with cheaper roofing materials, a rigid adherence to solidity, and, on aesthetic grounds, a commendable dislike for galvanized iron. Such a policy has been responsible for high rentals in some instances, and for high purchase prices when estates are broken up.

The type of house and of farm buildings also varies from district to district. It is, therefore, impossible to sum up the true position for the country as a whole; the less so, because substantial buildings are capable of withstanding years of neglect without the absolute necessity of repair, but the day of reckoning is heavy in proportion as it is postponed.

There are, however, whole districts where the farm-houses, buildings and cottages are entirely out of keeping with modern standards, and where there is much dilapidation. It is not only dilapidation that needs to be rectified, but houses, buildings and cottages are frequently dark, airless, ill-designed, cramped, and in themselves very inadequate, ill-placed in juxtaposition to each other and in relation to air, sun and dryness.

RURAL HOUSING AND FARM BUILDINGS

I should like to see the matter of rural housing and farm buildings placed in the forefront in relation to the resuscitation of the country-side. Ventilation—windows of reasonable size capable of being opened—proper facilities for segregating the household, and dryness should be rigidly insisted upon. It is not only that houses and cottages which should be condemned are frequently not condemned, but that the standards of adequacy are set ridiculously low, little or no account being taken of the extremely important matter of convenience.

It is the same with farm buildings, which are often arranged, it would seem, to give as much extra work as possible. The dairy accommodation in literally thousands of small farms is totally inadequate, and the byres are dark, airless and insanitary. On many farms the buildings as such are insufficient, and therefore set a definite limit to improvements on the land which would result in a greatly increased stock-carrying capacity. Recent years have seen great advances in the design and constitution of buildings, and much can now be done with galvanized iron. Speaking generally, it is the homesteads on the poorest lands that require most attention; consequently repairs and extensions to the housing for man and beast should be the first acts in a well considered programme of land improvement.

The question of rural water supply has been a matter of urgency for many a long year; without abundant and pure water ready to hand no living conditions can be considered satisfactory and no steadings maintained in a proper state of cleanliness. It is really disgraceful that any householder or cottager in this country of ample rainfall should have to carry water from an outside spring, well or pump. In the country this is the rule and not the exception, and it is generally a case of how far the water has to be carried—several hundred yards where numerous cottagers are concerned. I am talking in terms of normal conditions and not of abnormal and droughty years. Health, I expect, depends first and foremost on a balanced ration in sufficient amount and well and cleanly prepared; then on an abundance of pure and clean water freely used, supported by adequate ventilation in the dwelling house. If these three necessities could be reduced to a common denominator I should not be surprised if the average low scale wage earner in the towns

RURAL FACILITIES

was not in a better case than the average cottager in the country. If every drop of water has to be carried, and especially if the safe supply is further away than the doubtful supply, it stands to reason that an insufficient amount of pure water will be brought into daily use. It would be interesting to obtain statistics as to the amount of water used in cottages per person and on farms for the cleaning of dairy and other utensils in relation to the distance of the supply. Isolated statistics of this sort are, however, unnecessary; what is necessary is a complete mapping of the water arrangements of the whole country.

In the long run the most economical course might well be to treat the whole country as one unit, and after a survey of needs and sources to take an arterial grid system of supply to every village and hamlet, to every cottage and field. Failing such a heroic course, and we live in no age of heroics where the country is concerned, much could be done by co-operation between local bodies, and co-operation between neighbouring landowners—failing this, much could still be done by individual authorities and individual landowners and even by individual farmers.

When it comes to considering the land itself, lack of watering facilities for stock constitutes a very serious handicap to improvement. Isolated fields in which there is no water for drinking can never be grazed properly, and unless maintained continuously in arable (which is incompatible with most systems of farming, and with the systems most largely adopted in this country) they are usually almost completely neglected or run together with fields having access to water. Lack of water is often the prime cause of the negligent husbandry on grass farms; it leads to the deterioration of fences and ultimately to what is no better than ranching, to thistles, to weeds in general, and to completely impoverished grasslands.

In 1927 I made a considerable enquiry as to the watering facilities on a large number of farms, and this in the high rainfall areas of Wales and the West of England.

The evidence I obtained was highly instructive, and very disconcerting: a synopsis is set out hereunder:

No. of farms involved	-	-	-	-	-	-	-	191
No. of acres, 25,524: percentage acreage with water	-	-	-	-	-	-	-	60

RURAL WATER SUPPLY

No. of fields, 3,413:	percentage fields with water	-	-	-	55
Percentage of farms with over 70 per cent. of fields with water					30
"	"	"	"	from 50-70	35
"	"	"	"	" 30-50	20
"	"	"	"	less than 30	15

The figures speak for themselves and show that nearly half the fields on these 191 typical farms were without proper watering facilities for stock, while on 15 per cent. of the farms water was available on less than one-third of the fields. All the fields scheduled as waterless were not necessarily completely devoid of water all the year round, but water would have been scantily available on such fields—if available at all—only during periods of actual rain.

The grazing season is when water is, of course, chiefly wanted. Even in wet summers it is only open ditches on heavy land or those connected with a definite source of supply that do not run dry almost immediately.

My friend Mr. Bligh has recently devoted serious attention to the watering facilities on his estate. He has adopted various ingenious methods, each appropriate to the particular area. One plan has been to provide a tank or holding area at an appropriate place in a field to collect road water (off a by- and non-tarred road). Water can be led from such a catchment to fields lower down. The cost varies for the different groups of fields according to the means that can be adopted. In one instance Mr. Bligh has been able to arrange watering for nearly 100 acres (including a house) at no more than 3s. 6d. per acre. In the case of about 142 acres, watered from a number of different sources, the average cost per acre has been roughly 9s. 6d. Such work as this gives a very appreciable amount of employment; indirect in terms of cement, bricks, piping and so forth—direct (and local) in labour. Mr. Bligh's direct labour costs (excluding haulage) on the average of all his schemes have worked out at approximately 5s. per acre.

If it is impossible to provide for water by any other means, a catchment may be made with a few galvanized iron sheets. This at least allows of controlled grazing during rainy periods, and that is when the grass makes the most growth.

The country people of to-day need not only to be properly

housed and provided with the ordinary necessities of life, they need reasonable amenities and opportunities for healthy enjoyment near their homes. The question of amenities is of the first importance in connection with isolated villages and hamlets, and of even greater importance where isolated farms and cottages are concerned.

The matter is of real urgency in the case of hill districts: it is not only that hill farms are falling out of use but that it is becoming increasingly difficult to persuade shepherds, and even more difficult to persuade shepherds' wives, to inhabit isolated and remote cottages situated on the sheep-walks.

The whole tendency is for hill land to run out of use, and, ironically enough, just when we are beginning to learn how to use it, and I am sure inaccessibility has as much to do with this as rigour of climate. To-day inaccessibility and remoteness from the cinema and the town are the things above all others that the younger generation will not tolerate. There must be no such thing as inaccessibility, of that I am quite certain, if we desire to maintain and increase a vigorous rural population in hill districts and in remote parishes. There are three distinct methods of countering inaccessibility, and I believe nothing more important than this could be undertaken in the interest of the countryside. The three methods are: the ample provision of roads, a road good enough for a motor cycle should reach every single habitation in the country, and one good enough for a car should reach every single farm; the provision of a village club-house and of a cinema in every isolated village which serves a large and scattered district; the re-grouping of isolated farms and shepherds' cottages so as to bring them together into hamlets. There are two further important aids—an extension and amplification of the rural bus services and the telephone.

I will enlarge upon each one of these methods of dealing with the situation, but in passing I would point out firstly, that amenities are always most to be desired, if not actually necessary, in direct proportion to the difficulty and expense of providing for them; and secondly, that practically all of the suggestions I have put forward would be advantageous in connection with bringing urban holiday makers into closer contact with the country; and this is particularly so in relation to tracks and roads.

RURAL TELEPHONE SERVICES

To the housewife and the isolated mother the telephone gives a great sense of security, while every farmer should be on or within easy reach of the telephone. Rural automatics, or at least call offices, should be instituted not necessarily only where they are demanded, but where, in the interest of the community, they would be of value, if only in an emergency. No considerable areas of country, no matter how inaccessible and how scattered the homesteads, should be without the telephone. This business of obtaining eight subscribers before setting up a rural automatic exchange in a remote district is the height of short-sighted folly. Set up the exchange and the subscribers will eventually come in, while in any event the service should be supplied as part and parcel of the general services to which every citizen is entitled, no matter where he happens to live or what his occupation. A flat rate is essential for all rural calls, and it is unfair to calculate the rate on an exchange and mileage basis, for in scattered districts nearly all the calls will be outside the range of a particular automatic exchange. It is a virtue to live in a remote place and not a crime, a virtue to visit a remote place and not a crime. A universal telephone rate is as rational, as just, and certainly as desirable as a universal postage rate—a universal telephone rate is probably not yet feasible, but a county or a regional rate should be instituted.¹

The provision of roads to isolated farms and cottages is essential relative to the improvement and reclamation of land, and not only for the inhabitants. Wide and well surfaced roads are

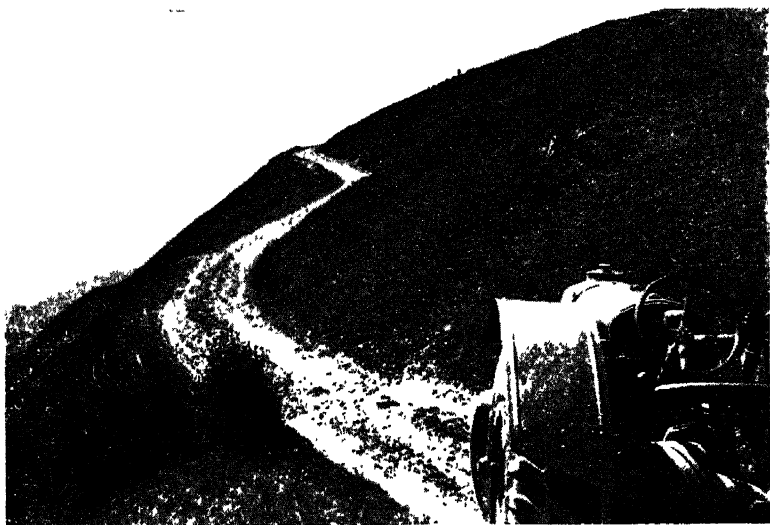
¹I have had considerable experience relative to the telephone, and in a small way I am a pioneer. I have always, and in the early days at very great expense, had it installed in each house I have occupied outside Aberystwyth, and on each occasion my house immediately became a sort of local exchange. I have been instrumental in saving the life of a cow; I have been the first to give the glad news in the case of a birth, and on several occasions have been able to hurry a doctor to a very sick person. After endless trouble I eventually got a rural automatic installed at Pontrhydygroes in the hills behind Devil's Bridge, and thereby benefited a whole district. I want the telephone at Nant Rhys, the shepherd's house on the lands of the Cahn Hill Improvement Scheme, miles from anywhere, and I am informed that the cheapest, if not the only, method of installing the telephone there would be to obtain eight subscribers—the pigsties, the poultry house, the cow byres, the sheep pens, the shearing shed, the stables, the cottage itself and the dipping bath—and demand a rural automatic!

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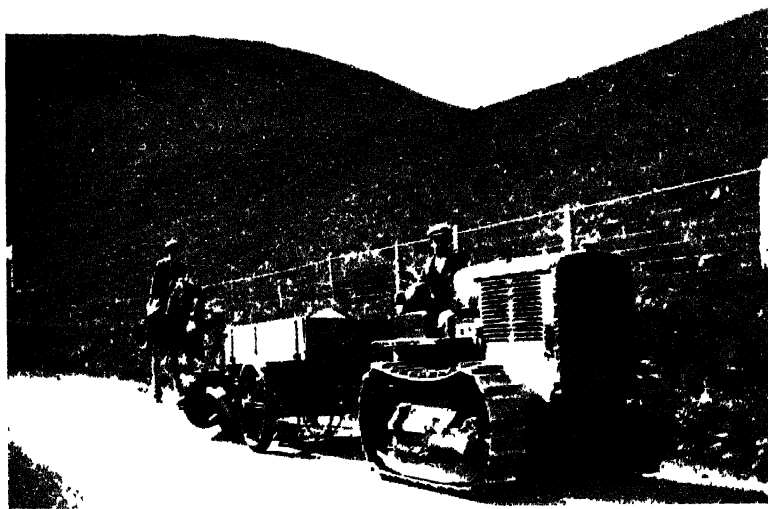
not called for. What is necessary is a reasonable surface, the removal of boulders, proper culverts and bridges—roads and tracks which are car-worthy and motor bicycle-worthy at all times of the year. Many hill farms are only approachable by two to three, and sometimes many more, miles of quite impossible track, hardly fit for a pony and difficult to walk over. It is essential too to provide a sufficiency of passing places for cars on all narrow and on all more or less dangerous mountain roads and tracks, while in the case of many of the latter the hairpin bends are frequently too sharp and steep to be negotiated by a car except at considerable risk.

This question of what I may describe as track-roads has been very largely neglected—great tracts of beautiful and inaccessible country are thus to be opened up and made available to the urban cyclist in particular, and to some extent to the motorist. All roads and tracks should be made the concern of local authorities, for with the breaking up of estates, private roads and tracks in many cases have gone completely out of repair. The road fund should contribute to the provision of ultra-rural track facilities on a scale at least as proportionately generous as that on which it contributes to the improvement of the great highways. Any action that tends to decrease the traffic on the main roads during the holiday season decreases the dangers inseparable from over-crowding. I will revert to this question when dealing with my national park, but it is desirable here to have emphasized that the provision of adequate track-road facilities for a scattered rural population would also cater for urban holiday makers—a further and, in my view, a complete justification for assistance from the road fund.

The nucleus of track-roads exists in almost every hilly and sparsely populated area of country, although in some districts to a greater extent than in others. Because of the once prosperous lead mining industry, Central and West Wales are particularly well provided with tracks that could easily be converted into track-roads and, by a little joining up, the usefulness of the system could be greatly extended. The Cheviots and the hill districts in the North of England are not nearly so well off in this connection—the track-roads to a considerable extent would have to be constructed *de novo*, although here, as in Wales, much



A mountain track, 1,500 ft. above sea level



A mountain road, 1,000 ft. above sea level

could be achieved by the joining-up of blind ends. There is a great deal of rural unemployment, and this is all too true of the remote districts where track-roads are frequently so urgently needed.

The road facilities, such as they are, in many remote hill districts have altered comparatively little, at all events in the routes followed, since the days of the pack horse. In those days, relatively speaking, isolated lowland farms were no better served than those in the hills, with the result that the isolation of the hill man was not unduly accentuated, and, by the standards then obtaining, was a matter of no great consequence. Hence to a large extent the haphazard distribution of hill farms.

The lowland roads and lanes have been modernized: over-modernized indeed, since an enormous mileage of even the essentially rural roads has been made dangerous for horses. Every ultra-rural road—and for that matter every trunk road—should be provided with a verge to meet the needs of the horse. All track-roads and all lanes, too narrow to allow of both a horse-way and a car-way, should be wholly surfaced to suit the horse, the surface being sufficiently good to cater for cars at slow speeds.

The village club and the cinema are necessary not so much in direct proportion to the size of a village, but in proportion to its isolation and distance from a town, and in relation to the number of remote cottages and homesteads which they are likely to serve.

Hill villages should be exceptionally well planned and made as far as possible into self-sufficient centres of social intercourse and amusement. A village hall and a village club are therefore the first essentials. Add to that an organization which sent a peripatetic cinema (a 'Carnegie' cinema) into every such village on a weekday evening, say once a fortnight, and a very important step forward would have been taken in the resuscitation of the rural life of the country.

There remains the question of the excessively isolated hill farm and shepherd's cottage and particularly such as stand above or near the rigour-of-winter-climate line. Those who like myself believe in the economic possibility of hill land, and who are desirous of making the best use of such land, and at the higher elevations, are here faced with an acute problem. Numbers are

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not everything. Hill farmers and hill shepherds are great people, and hill districts have long been strongholds of human worth. How many of the best lowland farmers have not migrated from or been born in the hills? And it is not only great farmers who have been born and nurtured on the hills. I regard the depopulation of hill districts as a serious national matter, and far indeed from being only of local significance—a matter that calls for national action. Much could be done by re-orientating the boundaries of sheep-walks, and by bringing shepherds' cottages and farm-houses together into scattered hamlets in well chosen situations at not too high elevations. Given good enough tracks and a motor bicycle with reliability-test tyres, a shepherd, even in the winter, could go considerable distances to attend to his flocks. We may be driven to adopt entirely new methods of hill management whereby the higher and more isolated land would only be used for summer grazing when the shepherds would migrate with their flocks to a *hafod* (or summer hut) in the spring. In this country the distinction between summer lands and winter lands is not sufficiently great, nor is the amount of land above the rigour-of-winter-climate line sufficiently considerable for such a method to be really justified in relation to the potential stock-carrying capacity of our hill land as a whole.

With the provision of better facilities as to road-tracks, and more amenities, accompanied by a certain re-grouping of farms and cottages, I do not believe that such a course would be necessary. Unless, however, some action is taken to stay the drift from the hills, it appears more than probable that a great deal of land may fall completely out of use. It would seem necessary that financial assistance should be given to local authorities and to landowners if the extensive area of hill land in this country is to retain a virile population and to be used to proper advantage. No hill farm or shepherd's cottage should be completely isolated; such isolation is unfair to married couples with young children. The modern mother cannot be expected, and will no longer be willing, to tolerate such conditions or to risk the innumerable hazards. If it is impossible to provide an adequate network of track-roads, isolated farm-houses and cottages should be condemned and re-erected at some point where they can be reached by doctor and district nurse by car.

VILLAGE CLUBS

The urgency of the matters I have here brought under review has been borne in upon me to an ever-increasing extent since I have myself had the control of land, and since I have been touring the country and talking to farmers with the one object of exploring the possibilities of reclamation and land improvement.

Deep-seated causes that operate against purposeful action being taken in any direction are so liable to be regarded as inevitable that they are usually ignored till they revenge themselves by wrecking schemes that have failed to grapple with first essentials. It is thus with rural England, and even to a greater extent with the more isolated districts of rural Scotland and rural Wales. If reasonable amenities and facilities are not brought to the country-side, people will ever drift towards such amenities and facilities. Therefore, I would say that facilities and amenities must be taken right through the whole country, and not only to the larger villages and more favoured districts. There is such a thing as drift from isolated cottage to hamlet, from hamlet to village, as well as from village to town. The very hard schools of life—the sailing ship and the isolated hill farm—are of the past: new standards are demanded alike by the ship-owner, the farmer, the sailor and the agricultural worker. We still navigate our ships across the most dangerous seas—a hard school yet, but not as hard as in the days of sail. The nation still needs the schooling of hill land—even though this too may not be as hard as of yore—to sustain and invigorate both its agricultural and urban population.

CHAPTER XVIII

The Agricultural and Rural Population

The human being and the land. Personality; town and country environment. The village 'idiot' and illegitimacy. Love of the country. The countryman and new ideas. The purity of country stocks; the laws of segregation. Recruitment from the country essential for the towns. The outlook of the bondholder is not that of the farmer. The essential features of the country; influence of modern resources.

THE most valuable product of the land, I am endeavouring to argue, is the human being, and consequently, and thus considered, the quality of the agricultural and rural population must rank as of supreme importance. At the outset, therefore, it is desirable to look a little closely into this matter of quality. The quality of a human being is to be judged by his usefulness as a citizen, that is to say, by his phenotypical attributes (his appearance and personality) and by the genes—his genetical (hereditary) potentialities—he carries latent within himself. In man phenotypical attributes are infinite in their complexity, and their precise manifestation (in terms of usefulness, geniality, tolerance, courage, and all those other peculiarities which in their intensity and interaction constitute personality) is influenced to an almost overwhelming extent by the conditions under which he lives. Genotypically and as a potential disseminator of genes man for all practical purposes may be regarded as being uninfluenced by his environment.

The difference between the environment of the townsman, and that of the countryman is so great—of the order of the difference between the strictly physical and the strictly biological—that the typical townsman is hardly qualified to estimate the quality (as rendered manifest in personality) of the typical countryman. The argument is frequently put forward that the

PERSONALITY

cream of the country has been drawn to the towns, and only the unenterprising have been left to stagnate in rural districts. The truth I think is that the stagnation, if stagnation there be, is only skin deep. It is the result of environmental conditions consequent upon the nation's neglect of the country, and not of the wholesale and long-continued drawing away of the best stock from the country. In other words, genetically the country stock is what it always has been, despite the drain to the towns, and because more inbred (locally considered) and less mixed (genetically considered) in its national aspects it is the sounder of the two stocks. The more 'enterprising' boy in a family has perhaps sought his fortune in the towns. Perhaps he was only more precocious than his brothers who stayed at home. Was he any sounder, and did he take away to the towns any genes (hereditary attributes) of greater national usefulness than those his brothers and sisters retained on the land? In this connection the laws of segregation are always operating, and operating to safeguard the quality of the country stock. The sons of the brothers remaining in the country are just as likely to be 'enterprising' as are those of the brother who sought escape in the town. And incidentally such have been the habits of the 'enterprising' (who have cut out for themselves successful town careers) and the habits of the 'less enterprising' (who have remained in the country) that the 'less enterprising' are likely to have brought up the larger families.

During certain phases of our industrialization in particular, whole families, and on a very considerable scale, have migrated from the country to the towns. But in more recent years it has been individuals rather than families who have drifted into urban employment. While even when whole families have gone into the towns, there has frequently been a partial return to the country. This has been particularly true of the mining districts. A very appreciable number of Welsh farmers and of Welsh agricultural workers of to-day—as for that matter those of the immediately preceding generations—for example, have worked at one time or another in the pits.

The migration to the towns in the main has always been a matter of a flow inwards in ever-widening circles, but first from the immediately surrounding country. This can be well seen in

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connection with the anthracite industry of South Wales. The surrounding country consists of poor land, but prior to the opening up of the mines it was reasonably well farmed. When the demand for labour became insistent it was the sons of these farmers, and often the farmers themselves, who flocked to the mines. It was not only that there was a great shortage of houses, but also that on this poor land to work in the mines paid better than to farm; the consequence has been that the farms have been cut up, and are now practically all comparatively small holdings occupied by men working in the mines. It has been for houses and not land as such that there has been a demand, and for which primarily rent has been paid, and so it has come about that the land (most of that 35,000 acres east of Ammanford to which I have referred) has lapsed into a state of almost complete worthlessness—in most cases only a cow or a few cows being maintained on one corner of the holding. So here we have the extraordinary spectacle of a thriving industry maintaining a large population encircled by small holdings which are contributing in negligible amount to the food supply of the district.

The inward flow from further away has been wholly towards the mines; no agricultural replacements have been possible because this peripheral land is in the occupation (nominal occupation to all intents and purposes) of those working in the mines. That such a state of affairs should be possible is an interesting commentary on the attitude of mind of the nation towards the land, and towards the importance of fresh food for its industrial population.

This is, however, incidental to the theme of my present chapter, to which I must now revert.

Much is made of the 'village idiot' and of the pockets of unsatisfactory stock that undoubtedly disfigure some rural districts. To assume tacitly, however, that every village has its 'idiot' and that every district has its undesirable pockets is to libel the countryside, and to give weight to only one aspect of comparatively close inbreeding. The country to a large extent has maintained its own standard of morals and has produced its own class of illegitimate children. Moreover localities where deficiencies are apparent are more than set off by those far more

THE VILLAGE 'IDIOT' AND ILLEGITIMACY

numerous districts where excellences are concentrated, and where the moral code is exceptionally high.

When the immense significance of the laws of segregation is realized, and the importance of giving those laws reasonable scope is fully appreciated, an all-embracing research will perhaps be undertaken regarding the genetical consequences of illegitimacy. Such a research would embrace alike the doings of the 'great' and of the 'lowly'. At present our judgments are prone to be biased because the illegitimate person only comes under prominent notice when in any way defective, and when such a person engages the attention of the police or of the local medical officer. From the point of view of the well-being of the nation the really important question to be settled is the number of fools, louts and criminals that can be regarded as a fair price to be paid for each man of action, enterprise and genius who is born within its boundaries.

To return, however, to the alleged genetical consequences of the drift from country to town, love of the country and mistrust of the towns rather than lack of initiative may well have been the human trait which was responsible for holding large numbers to the country during the height of the migration to the towns.

To hold to the country despite everything, and for the sheer love of the country, implies strength of character rather than the reverse, and I think it is just as legitimate, because just as well substantiated by the facts as far as we know them and as far as they have been explored, to give prominence to this selective influence as to lack of initiative.

This brings me to a consideration of the personality of the countryman—his reaction to his environment. It is the habit of the townsman—of the pundit and the arrogant—to disparage the countryman and to regard him as slow and unenterprising. More probably, however, the townsman mistakes shrewdness and caution for sloth and lack of enterprise. To be slow and of few words, which in fact may be the cloak that covers much wisdom, is so easily mistaken for being devoid of wits. To be slow may be to be devoid of learning in the sense of having been taught most of what one knows by somebody else, that is if one estimates learning in the manner of the class room. The man who has devoted a number of years to his education, and

who owes his position very largely to his examination record, is likely to be misled into thinking that his kind of learning is the only kind. The countryman knows better, and hence his tolerant mistrust of the townsman. The countryman has taught himself how to adjust himself to his surroundings and how to remain in equilibrium with his surroundings, no matter how exacting and how narrow. In this, his education—in adversity he is the less discontented man—surpasses that of the townsman. The countryman, because his self-education necessarily continues as long as he maintains active contact with the land—and this no matter how well educated he may be in the class room sense—acquires a certain, though hardly conscious, scepticism towards both the facts and generalizations arising out of knowledge systematically striven for. He has been beaten too often by the unexpected to believe it possible that the seekers after knowledge can really and in truth attain to their goal: there is always something that has not been taken into consideration that will later come to light to confound and to confuse. In this he has attained to a certain high measure of wisdom, if at the price of a too great trust in his own subconscious reactions to his own, his very own, experiences. To the farmer and to the countryman in general to see, and only to see, is to believe, and hence a splendid and robust mistrust of the printed word and of the assertions and dicta of the pundit.

The countryman will, however, react quickly enough to new ideas and to new teaching when once he has satisfied himself that the ideas and the teaching are applicable to his own peculiar needs. The internal combustion engine—as a stationary engine—has now found a place on a large number of farms in every district, and the tractor to-day is a recognized part of the equipment of arable farming. The rapidity and success with which farmers and farm hands alike have made themselves competent mechanics is a sufficient answer to those who think that the countryman is devoid of intelligence and of the will to learn, while the rapidity with which the farm worker has adopted gum boots (stockmen in particular) and overalls is equally significant.

The fact of the matter is that the countryman is proud and self-reliant, not that he is a backwash from the industrial

THE PURITY OF COUNTRY STOCKS

revolution, genetically unsound and temperamentally inept. My own firm belief is that the drift to the towns has tended to concentrate the excellences of the rural population rather than the reverse, and that love of the country has been the dominant factor in retaining those who remained loyal to the country and to country pursuits. If all this is so, then our diminished country stock is a much-to-be-treasured asset to the nation, of immense value genetically and of equal value to current citizenship.

The country stock in large measure is a pure stock—English, Welsh, Scotch. It is more than this, for because of local inbreeding, and despite modern transport facilities, the country stock to a very large extent is a honeycomb of a great number of relatively pure stocks, each representing slightly different concentrations of excellences and deficiencies. Every breeder knows that a foundation of pure stocks constitutes an essential reservoir upon which to draw in the improvement and development of a race—indeed it has been out of this knowledge that have grown the great developments in animal and plant breeding.

The country may, I think, be regarded as a magnet which attracts to itself the national stock. If endeavours are made to place considerable numbers of urban workers on the land, it will almost certainly be found that those who return will be overwhelmingly pure English, pure Scotch and pure Welsh in their ancestry.

The country then provides those foundation stocks that are necessary to maintain the vigour and inherent peculiarities of every race. The British countryside in short carries in its population the genes, unsullied and uncontaminated, that maintain and perpetuate our national vigour and our national characteristics.

To read the obituary notices in the papers is to be struck by the frequency with which men who have risen to positions of eminence and importance have been of country origin. It is a byword that the country parsonage has been a cradle from which has sprung an exceptionally large number of men who have won for themselves important positions or have served the country well in the highest posts.

There can be little doubt that a steady recruitment from the country is essential to maintain the vigour of every trade and

RURAL POPULATION

profession. Mr. Wilson Fox in a memorandum prepared for the Departmental Committee on Agricultural Settlement in the British Colonies (1906) has stated that young men from the country frequently come to the large towns to fill pre-booked positions. Countrymen are in request for posts demanding special reliability. He states further that the country-born do not in the main contribute to the town unemployed. The percentage of country-born is remarkably large in many employments. Thus 66 per cent. of the members of the Inner Divisions of the London Metropolitan Police were country-born, while in a representative section of the Glasgow police the country-born amounted to 91 per cent. One-quarter of the staff of the South Metropolitan Gas Company consisted of men who had actually been farm labourers.

Amongst my own friends on the land—small farmers and farm workers—I am always hearing of sons who are doing well, doing really well, in London. One perhaps a chemist, another in a bank, several in retail milk, many in the professions; and I think it is appropriate that the land should contribute as largely as it undoubtedly does to the medical profession.

I believe if it were possible to grade up the personnel of the trades and professions and make an accurate tally of the allocation of responsible posts between the town-born and country-born, and having regard to the overwhelming numerical strength of the town-born, the position taken by the country-born would stand as a complete and unanswerable justification for maintaining a sufficiently large rural population.

I want to see a large rural population for its own sake and for the sake of those who contribute to that large population, but in the interest of the nation as a whole and of the Empire the most urgent need for a vigorous and ample rural population is as a prop to the great cities, as a recruiting ground for the trades and professions, and, most important of all, as a means of sustaining the nation in a condition of vigour and sanity.

The dangers ahead are many and far-reaching, and there is nothing I so greatly fear as that the whole countryside will become urbanized in outlook, and commercialized and industrialized in spirit. The farming class, as a class, has never sought wealth for its own sake; the landsman has not the spirit of the bondholder.

THE ESSENTIAL FEATURES OF THE COUNTRY

It will be sad and bad for the country if the marketing schemes and the movements in the direction of making the farmer first and foremost a business man act also in the direction of making him less of a landsman, and imbue him with something of the spirit of the bondholder. The danger is a real one, and will be further accentuated if the small man is absorbed by the larger man, and the larger man by farming companies. All this, though I hope not inevitable, is but too likely to follow in the wake of the industrialization of agriculture.

The bulwark that I think can most effectively stand in the way of the urban spirit swamping the land spirit is a large number of independent occupiers, and I pin my faith to owner-occupation, and this I shall make the corner-stone of the concrete proposals that I shall venture to put forward.

Come whatever may, the countryman can no longer live in glorious isolation and entirely on his own resources. On the physical plane the motor car and the motor bus have broken down the barriers of isolation; on the mental plane the B.B.C., which fills the air with a conflicting mass of opinions and no little high-browism, has undermined his solitude. The problem of to-day is to bring a sufficiency of the amenities and facilities of the towns to bear on the life of the country to satisfy the rising generation, without at the same time too greatly weakening those influences which in the past have contributed so much to the personality of the countryman. If we can maintain the essential features of the country, I am hopeful that the environment of the country and the tasks of the country will have a sufficiently mellowing influence to counteract the B.B.C., the cinema, and all the modern tendencies which are so inimical to sturdy individualism and to the formation of well-founded opinions based primarily on the solid rock of deeply felt personal experiences.

The educated townsman of to-day doubts everybody and everything, and all too frequently in the depths of his being doubts most of all himself. The countryman doubts only the townsman, he doubts not his own philosophy of life. A nation to be at once stable and progressive needs in its population a just balance between ardent doubters and steadfast believers.

CHAPTER XIX

Increasing the Agricultural and Rural Population

The direct and indirect influence of field sports and games. Agricultural employment; land settlement versus re-conditioning. A Homestead and Land Improvement Aid Society. Summer camps and agricultural cadets; recruiting and conditions of employment. Work for landowners and farmers as well as for public bodies. The labour needed for water, fencing, cutting bracken and eliminating docks. Size of holding in relation to present occupiers and to land settlement. Different aptitudes of townsman and countryman. Age in relation to aptitude.

THE rural population owes much to field sports, and not a little to golf. Although unjustifiable on grounds of equity, the average weekly wage earned by the man employed in connection with sport is greater than the average earnings of the man working for the farmer.¹ It is all to the good, however, that some of those working in close association with the land should be paid at least a relatively good wage. The groom in the hunting stable, the gamekeeper, the green-man, the ploughman and the shepherd are usually equally of the land and essentially country folk. Any cause that makes it possible for healthy, well-housed, well-fed and well-clothed families to be brought up under typically rural conditions and in an atmosphere of rural pursuits is to be welcomed. Sport, therefore, is an important

¹In the case of quite a small and local hunt a kennel huntsman would get from 45s. per week with a house, and this perhaps in a county where the agricultural wage was no more than 30s. a week. Private grooms would generally get about 40s. per week. The wage of a head gamekeeper, or a river bailiff would be from 40s. a week with a cottage, while gratuities and extras constitute a considerable additional source of income. A head green-keeper on an averagely well-kept 18-hole golf course would get from £3 10s. to £4 per week, while the wage paid to the ground staff as a whole would be appreciably in excess of the minimum agricultural wage.

factor to be considered in relation to maintaining and increasing the rural population. Hunting, in many districts, is a definite part of country life and gives a very real amount of employment. As I have pointed out in an earlier chapter, the tendency in the direction of altered farming methods and greater intensification is almost certain seriously, or completely, to interfere with hunting in some districts. In such districts the earnings of the more intensified farming and the greater employment would have to be considerable—sufficient to offset the employment given by the hunt and the money which a pack of hounds brings into a district. There are 193 packs of foxhounds in England, Wales and Scotland, and including other packs it has been estimated that hunting gives direct employment (grooms of followers of hounds and hunt servants alone) to over 20,000 men, which means an expenditure of nearly £2,000,000 per annum in wages. Something over one million and a half pounds per year is spent on feed and bedding, most of which goes into the hands of local farmers. The total, direct expenditure due to hunting (including also veterinary fees, shoeing, saddlery, licences, clothes for hunt servants and other items) has been estimated at £4,550,000.¹ The hunting industry is therefore an important one to the country, while association with the horse is undeniably a very healthy and satisfying feature of rural life—and a peculiarly English feature. No increase in the hunting industry can, I think, be expected; a steady shrinkage is more likely.

There are many sides to hunting, some of them undesirable, but, thinking in terms more particularly of the strictly local hunts and of employment in association with the horse, my own view is that rural England would lose something of real importance in the realm of psychological influences if the huntsman's horn was never again to echo through the covers. Some set-off—and possibly in future years a very appreciable set-off—to a shrinkage in the number of hunts may prove to be a great increase in holiday riding on the part of the urban population, and this is a matter to which I shall revert in a subsequent chapter.

¹The amount of money brought into the country indirectly because of hunting is of course considerable, for any hunting man living in the country, or staying in the country, even in these days of rapid and continuous movement, must necessarily circulate money in the villages.

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The last fifty years, taken as a whole, have witnessed a great increase in shooting and fishing—an increase which has influenced the rural districts in many ways. Sporting rentals, although very sensitive alike to periods of depression and of expansion, and frequently in themselves not large, have nevertheless constituted an appreciable and welcome source of income to the landowner. They have, therefore, not been without influence on the number of estate employees (woodmen, carpenters and the like) that it has been possible still to retain. The fact that the sporting acres contribute a certain quota to the local rates is of definite importance as affecting the finances of the country-side, and has an appreciable indirect influence on rural employment. Shooting and fishing in the aggregate give a large amount of direct and permanent rural employment, and of casual employment during the winter. Unfortunately, however, the amount of both whole-time and casual employment is very variable, depending so largely on the goodness of the times. Since the war, and particularly since the recent depression, there has been a marked falling off in the rearing and preservation of game—with concurrent unemployment in the ranks of the gamekeeper.¹ The whole question of sport in relation to the

¹On small estates of perhaps 1,000-1,500 acres where the owners have given up preserving, a woodman-keeper will probably be employed. Where game is preserved, a keeper would be employed to each 1,000-2,000 acres, while in Norfolk, Suffolk and the good game districts, especially those within easy reach of London, there would be more keepers. The aggregate wages are considerable; for example, before the war on a large shooting estate in the eastern counties wages of gamekeepers, beaters, etc., for twelve days' shooting amounted to £320 a year in a parish of which the population was 929. At the time of the enquiries into grouse disease there were about 5,300 gamekeepers in Scotland. The sporting rents per acre, of course, vary considerably in the different districts. They are often highest where the agricultural land is poor and the agricultural rents low, thus the sporting rents on some of the sandy heaths of practically no agricultural value of the eastern counties may be 4s. to 5s. an acre. In some cases the sporting rents may be about 2s. 6d. per acre and the agricultural rents about 12s. 6d.; in others the sporting rents would run about 1s. 6d. and the agricultural rents about 25s. In the case of rough shooting the sporting rents may average at no more than 6d. per acre where the agricultural rents would be perhaps 8s. to 10s. Sporting over woodlands is usually rated (where rates are legally applicable) at about 2s. 6d. per acre (rateable value) and over cultivated land at about 1s. per acre (rateable value) downwards.

THE INFLUENCE OF FIELD SPORTS AND GAMES

finances of the countryside and in relation to direct and indirect employment in the country, as indeed in relation to the atmosphere of the country and rural-mindedness, is one of great national importance, great interest and great difficulty.

I had hoped and intended to deal somewhat exhaustively with this whole complex question, which would involve *inter alia* consideration of the effects of syndicates, and the effects of the life and habits of sportsmen of all degrees of sportsmanship, both resident and absentee: of huntsmen, of kennel-men, of grooms, of gamekeepers, of beaters and, by no means the least important, of poachers; but when I began to make a serious endeavour to collect facts and material, I at once realized that the subject demanded more thought and more research than I could at present devote to it. I repeat, however, that sport is a fundamental part of the life of rural England, and therefore I am painfully conscious of the fact that I am compelled to leave a serious gap in the pages of my book.

As a mere opinion, I think it probable that the employment given by field sports in the coming years, ebb and flow as it inevitably will, is likely in its general trend to decrease. The urban population by coming into the country in ever-increasing numbers cannot fail to interfere with field sports. Field sports cannot cater for the masses. In the case of many of the larger hunts the fields have already reached dimensions that are ruining the sport, while the country-side is unable to cater for more than a strictly limited number of guns. The urban population will, however, create rural employment in new directions, and probably in a number of directions which at present it is impossible to foresee. In my next chapter I shall discuss this question, but I may anticipate to the extent of saying that I shall produce arguments that I think justify the belief that more golf courses will be one result. A full and well-kept 18-hole course employs on the average about six green-men. Six men to 100 acres, sixty per 1,000 acres of golf course, and this usually on land unsuited to high farming: the average of arable farming is only about thirty men per 1,000 acres, though on 'Potato' farms more than sixty men will be employed per 1,000 acres. Dairy farms employ about thirty men per 1,000 acres, while the figure for

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mixed farms is 20-26. Hill sheep farms give employment to only two men per 1,000 acres.

I now come to the crucial question of direct agricultural employment (the production of crops and livestock) and of employment in connection with agriculture. There are three directions in which the matter should be explored. Firstly, the provision of facilities on existing farms; secondly, higher farming and land improvement on existing farms, and thirdly, the setting up of additional holdings. All three methods of giving employment could be put into operation concurrently. Those who think primarily in terms of settling the urban unemployed on the land almost invariably cast their eyes only in the direction of new holdings. Just as the Forestry Commission finds it most easy to purchase land and start *de novo*, so is it more easy to purchase land and set up new holdings than to organize the means of improving the present holdings and intensifying the farming—to accomplish the latter involves dealings with a multiplicity of owners. It is also argued that to set up new holdings is to increase the agricultural population not merely temporarily but for all time. On the other hand there is the question of the selection of worthy candidates for the new holdings; the question of equity and fairness as between those who have struggled to maintain themselves on broken-down and more or less derelict farms and those who would be placed on new and presumably well found holdings; and finally, the question of the dilapidation *qua* dilapidation of so many homesteads and the derelict condition of so much land. There is another aspect to the whole matter, and an aspect that is likely to be fraught with serious consequences for the countryside if a policy was adopted of setting up thousands of small holdings as the sole or chief means of finding employment for the urban population on the land. There would arise two, almost inevitably antagonistic, classes of producers. The one class, to be successful, necessarily assisted in almost every direction from the laying of the foundation-stone of the first holding, through the sowing of the first seed to the marketing of the produce. Carried to its logical conclusion a properly arranged and co-ordinated series of small-holding colonies would postulate a system of market stalls or even of shops maintained by the parent organization on behalf

of the several colonies of holders. This would be all to the good—always provided equally purposeful steps were being taken to assist and not merely to advise or browbeat those farmers who are endeavouring to carry on their business under the handicap of broken down and inadequate buildings and outrun land. No matter how great the difficulties of organization, I consider it to be absolutely necessary that the setting up of small holdings on a considerable scale should not precede the re-conditioning of the more woebegone of the present holdings, and I think that to assist the present holder would be as worthy an object of a State-aided, voluntary organization as to set up new holdings. If I were a millionaire I should endeavour to found a 'Homestead and Land Improvement Aid Society', and if I presented the Society with £500,000 I should be an incessant caller at the Treasury and the Ministry of Agriculture until I had obtained a pound for pound contribution to the funds of my Society. My Society would find a large amount of work which could be undertaken by the urban unemployed, both on the land and in close association with the land—my Society would incidentally act as a recruiting and training agency for the Land Settlement Association.

I feel most strongly that the first necessity is to re-condition the countryside. To do so would immediately employ a great deal of labour, and where the unemployed are concerned, and especially in the case of the younger men, immediate employment is so important. Besides, a few years of re-conditioning would give the nation as a whole time to become country-minded, and by then it would perhaps be possible permanently to absorb a very large proportion of those who would have found their souls and regained their manhood in the acts of re-conditioning. In any event to argue that it is not worth while to undertake an essential and long overdue piece of work because, when completed, it would apparently lead to no additional employment, and would have little influence on the problem of the unemployed, seems to me to reveal an almost incredible state of mind towards the processes and tendencies which are most likely to hasten recovery and progress.

'Work makes work and sufficient for the day is the benefit thereof' is surely the most promising and, I am inclined to think,

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the only human and moral attitude of mind in which to approach the problem of the unemployed.

As to the amount of labour that could be absorbed relative to facilities (houses, farm buildings, etc.) and amenities (roads, water, rural telephones, etc.) I can express no opinion, nor can I express useful opinions how such work should be best organized. As to the needs of the land, I think I can give some useful information and make at least comparatively sensible suggestions.

A great deal of re-conditioning work on the land is necessarily summer work, but some can be undertaken as well in the winter as in the summer. Important items are the repairing of fences and hedges, and the erection of new fences, the opening of ditches and other draining operations (I am not now referring to regional drainage schemes, but to the removal of surface water, operations which are normally a part of good husbandry); the cutting of bracken and of rushes; the elimination of docks and thistles; on many types of land the spreading of lime; the bringing of water to fields; the repairing of the farm roadways and tracks, and the stubbing of gorse, scrub and old tree trunks. Some of these tasks could be performed more easily with the aid of machinery, but there is not one of them which it would be derogatory to a man to tackle without horse or tractor.

My plan would be to endeavour to recruit from the young and unmarried men amongst the urban unemployed a considerable corps (those who object to a word which savours of the military are at liberty to substitute any word which may jar less on their susceptibilities) of agricultural cadets (cadet is a word of accepted usage in the purely agricultural connection). I should set up a large number of summer camps each under a cadet-leader and place out the cadets in groups of two, three or four to work on farms in the close vicinity of the camp. Several competent agricultural workers (alas, all too easily to be recruited from the rural unemployed!) would be a part of the complement of each camp. By working in conjunction with such men, the urban cadets would the more rapidly accustom themselves to the various jobs. Hearty co-operation from farmers and landowners would be necessary, and with careful planning and organization this could be assured provided that each camp was in charge of

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a competent cadet-leader. At present these men are wholly a charge on the State; I would place the weekly wage at about 20s., but the cadets would be fed, and supremely well fed, in camp, and provided with suitable boots and other essential kit at the expense of the State. The employers would pay at the rate of say 16s. per week per man. The actual rates would be calculated so that the exchequer would be slightly in pocket, or at all events not very appreciably out-of-pocket. The men would have been rejuvenated, and the land—the land itself—would have been benefited by a small but useful State subsidy. The probability is that at the end of the season some at least of the men would have had offers of employment, while others would have shown a definite aptitude for land work and a desire for further training with a view to settling on the land. Such in broad outline would be one method worthy of careful and serious trial in reclaiming both human beings and the land. As a matter of fact the experiment of labour camps has of course been tried, but it should be greatly extended even if to do so entailed quite a considerable State expenditure, and it might entail considerable expenditure in the possible event of landowners and farmers being unable or unwilling to pay more than 8s.-10s. per week for novice labour of this kind. Unless work is undertaken for private individuals (necessarily at a cheap rate) the out-door employment could not be found in sufficient amount—the amount of work that the Forestry Commission could give, for example, is relatively very small—and the innumerable needs of the land would remain unattended to. To set up summer camps without healthy employment when there is useful work to be done would be demoralising alike to the campers and to those who occupy unworthy acres.

Apart from the setting-up of camps, much employment could be found in this way for the rural unemployed. Employment could also be given to carefully selected men from amongst the urban unemployed—special consideration being given to the claims of youngsters who have never been in work and of those among the older men who earlier in their lives had worked on the land. It would be necessary to schedule a list of jobs which were of an improving and capital nature (and therefore of as much service to the State as to the individual);

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the men would be paid by the State but the employer, who would contract only to use the men on scheduled tasks, would contribute an appropriate amount (something between 8s. and 16s. per week) to the wage. All this, of course, savours of Speenhamland, but the conditions of to-day are entirely different from those of 1795, and it should now be possible to organize a modern system of 'Speenhamland' free from the abuses and corrupting influences of the earlier model. To have idle men (the rural unemployed) living within a few hundred yards of work that urgently needs to be done is perhaps a greater absurdity and a more corroding canker in the life of the country than all the evils and abuses of Speenhamland rolled into one. The organization of the whole modern system might possibly, and with many obvious advantages, be made the responsibility of my 'Homestead and Land Improvement Aid Society'. The men would then be wholly the servants of that Society. The Society, which in order to perform those duties would need State aid on a generous scale, would make all arrangements with the direct employers, laying down conditions and a scale of charges appropriate to each case, judged on its merits. Steadily and all the time the Society would be placing some men in permanent employment or passing others on to the Land Settlement Association. A large-scale experiment on these lines is urgently necessary, and a Society such as I have suggested, with resources of no more than one million pounds, could at least make an impressive beginning.

If we consider four items only, namely, fencing, the provision of water to the fields, the cutting of bracken and the elimination of docks, it will be apparent that there is scope for much employment. If the figure I quoted in an earlier chapter (based on a restricted survey) relative to fields without water facilities (40 per cent. of the acreage) were true for the whole of England and Wales, I calculate that taking into account both land in permanent grass and temporary leys there would be about $7\frac{1}{2}$ million acres to be provided with water for stock purposes. If all this land could be watered by the exceedingly simple and exceptionally cheap methods adopted by Mr. Bligh, to which I have already referred, even to do this (and leaving haulage out of account), would give direct labour on the land to over 20,000

THE LABOUR NEEDED FOR FENCING, ETC.

men for a year. In practice, in many, and perhaps in most, districts much more elaborate methods would have to be adopted, frequently involving piping and resort to a ram or other pumping methods, so that, apart altogether from the really large employment that would be necessary to take a water grid throughout the whole country, I should expect that the adoption of the simplest possible methods (and for fields alone) by farmers and landowners, independently and individually, would give employment to something like 30,000 to 50,000 men for a year.

With regard to fencing, I shall confine myself to the farm lands of England and Wales, and, with a view to forming a fairly reliable estimate, I have had made a number of sample surveys on the basis of the six-inch map. From these surveys I have calculated that there are approximately 903,000 miles of fences, and that perhaps 20 per cent. of these are not stock-proof. It would seem likely that 10 per cent. of the total length of fences need complete rewiring, and that a further 10 per cent. could be repaired with half the labour per mile. The length of hedges to be laid each year would amount to a further 10 per cent. of the total length of the fencing in the country. If my assumptions and calculations are reasonably accurate, my programme would require the labour of approximately 50,000 men for one year, or 5,000 men per annum over a ten-year period. The labour equivalent to that of one man would construct 4·7 miles of wire fence per annum, would repair and make stock-proof 9·4 miles per annum, and would lay 3·7 miles of hedge in a year. My estimate is in regard to labour additional to that now being utilized in fencing, and takes no account of the labour further required to maintain fences in good repair over an indefinite period.

On a conservative estimate there are in Wales alone some 152,000 acres of bracken-infested land. Of this total about 30 per cent. is on land too steep or otherwise too difficult to clear; a further 20 per cent. is probably required for purposes of winter bedding in the stockyard, some 20 per cent. might be cut by machines, and the remaining 30 per cent. lies on land that can be cut with the scythe. Fern can therefore be eradicated with great advantage from half the total bracken-infested lands in Wales. For this purpose it would have to be cut twice in the

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first year, twice in the second year, and perhaps once or twice in the third year. The effective bracken cutting season extends over some eight to ten weeks (beginning of July to early September). On this basis one man would cut (twice over) twenty-five acres in the first and second years, and machines would cut (twice over) 220 acres in a similar period. I should calculate that for bracken clearing in Wales alone nearly 2,000 men would be needed for at least three consecutive seasons with the addition of a considerable number of tractor-drawn and horse-drawn cutting machines.

Based on figures available with reference to dock control on the Welsh Plant Breeding Station I am able to form some estimate of the labour required under this heading for the whole of the farm lands of England and Wales. Dock eradication is likely to be a slow process, and the best method is still that of digging up the whole plant. The data I have show that one man could deal in this way with 925 acres per annum if the whole were of the degree of 'dockiness' similar to that from which the data have been collected. Assuming that only half the farmlands of England and Wales are in fact affected to this degree, and that the remainder are already free from docks, it would require 14,900 men employed full time in the first year. The number employed might conceivably decrease gradually over the first ten-year period, until it was reduced to about 5,000 men. These I would regard as a skeleton team whose function would be the ultimate elimination of docks. Dock pulling provides employment throughout the year.

My plan of rural employment might be further amplified by considering the question of vermin control, but I can only mention this in a general way. Rabbits and rats cause heavy losses to the agricultural industry in this country. In recent years the rabbit population has increased to formidable proportions in Britain; the dry summers of 1929 and 1933, together with the low prices offered for both skins and carcasses, have contributed to this increase. It is difficult to form any estimate with reference to the number of men who could be employed wholly on rabbit- and rat-catching, but it would certainly provide employment for a considerable body of men. If one assumed that one skilled rabbit- and rat-catcher would find full time employ-

ment on every 2,000 acres of farmlands in England and Wales, these activities alone would employ some 13,000 to 14,000 men.

I do not propose to deal in detail with the question of land settlement, for it is not one with which I have been in close contact, although I have devoted a considerable amount of thought to the subject. There are a few points, however, to which I think I can usefully draw attention. In the first place, there is no doubt that the import duties have given a real impetus to the production of cut flowers in this country, and to other intensive forms of production carried on both under glass and in the open; while, in the second place, it is to be noted that the larger farmer has shown an increasing tendency to adopt subsidiary enterprises, such as poultry keeping and vegetable production, and usually with considerable advantage to his balance sheet. These subsidiary enterprises most frequently take the form of that type of production best suited to the small holder. From the production point of view the small holder and the farmer are, therefore, not unlikely to be in increasing competition with each other as the years advance, although when general conditions again improve, and if the country adopts a comprehensive land settlement scheme, the question of prerogatives in production will probably solve itself. From discussions with friends in a position to speak with authority, the impression left on my mind is that in some spheres of production the ex-townsmen is likely to beat the countryman. This is perhaps true of orcharding and fruit in general, of egg production, and of a number of the more specialistic fruits of the soil. In so far as the setting up of colonies of small holdings are concerned, these aptitudes of the ex-townsmen, if they exist in fact, need to be very carefully explored, as does the whole question of specialistic and out-of-season production. Research is necessary on the one hand, to create new specialities, and to find new and cheapened methods of out-of-season production, while propaganda is necessary on the other hand, to popularize specialities that need not be expensive to produce. There is every reason to suppose that these and similar matters will not be lost sight of by the Land Settlement Association.

Evidence, as opposed to general, and not infrequently biased, opinions not based on evidence shows that in many instances,

despite the lack of proper organization and of an all-pervading national policy, the County Council small holdings have been anything but a failure. With an enlightened association to guide and organize the movement, the prospects for the future are exceedingly bright in the direction of small holders arranged on the colony basis, but I attach enormous importance to the creation of new products and new markets.

The colony is but one aspect of land settlement—the 5-10-20 acre holding is but one aspect. Land settlement should not be approached merely from the point of view of numbers, but also from the standpoint of high farming. High farming employs labour, and a man employed on the land at a reasonable wage is as alleviating to the unemployed as a man placed on a diminutive holding. To think in terms of farming, and mixed farming at that, and in terms of the whole country, it is impossible to say that x - y acres is the ideal sized unit. I am going to say, however, that in competent hands, and even on relatively poor soil, a sixty-acre farm is an admirable unit, a unit that gives scope for a great degree of ingenuity, and for the employment of several hands, and upon which there is no excuse for maintaining a single rod of unproductive land. I know several examples of farms of about that size which are models in every way, except for the buildings, and that is not the farmer's fault. I am also going to say that the younger men are not getting a fair chance—the farmers' sons and the sons of the land. The reports recently issued from Cambridge are significant in this regard, for it has been the younger men rather than the older who have shown the more favourable, or less unfavourable, balance sheets during recent difficult years. 'It appears that the younger men are more mechanically-minded and are more ready to try new methods and types of production than the older men.' This view, based on the most comprehensive economic survey that has been conducted in this country, confirms the opinion, born of long experience, that I have formed relative to conditions in Wales. At Aberystwyth for many years the Agricultural Department has undertaken the duties which now more generally fall to the farm institutes. The counties in the College area which do not maintain an institute give scholarships to farmers' sons who attend the 'Short Course' at the College. Incidentally I may

remark that in my view it is far preferable that a well-found central institution with a large staff of specialists and where research is in active progress should amongst its several duties also perform those of a farm institute rather than that each county should have, or aspire to have, its own institute. The centralized and regionalized system, apart from associating the students with an atmosphere of research, brings young men from different counties together: this widens their outlook and gives them opportunities of making friends outside the confines of their own county. The centralized scheme also serves to bring the advisory and research staff into close and personal contact with the farms and farmers of the whole advisory area.¹ At Aberystwyth we maintain an active Old Students Society and so follow up the careers of our Short Coursers. Too often it happens that the young man returns to his farm full of enterprise and new ideas only to have to submit to the stolidity and caution of a deeply entrenched parent. When at last the student's chance comes it is often too late, he too has become deeply entrenched. And so it is that men of great promise, men who, given the chance, might leave a profound impression on our agricultural methods, either more or less stagnate, or drift away from the land. The openings for the sons of agriculture are not sufficiently great, and this is especially true where families are large.

The personnel exists, the land is there. In England and Wales there are over 17 million acres in holdings exceeding 100 acres, and only about 7 million acres in holdings above 20 acres and not exceeding 100 acres. For modern requirements this apportionment is altogether too heavily weighted in favour of the larger farms, and in my view reacts directly against the maximum of enterprise on the land. The Cambridge reports indicate that profit bears a direct relation to amount of capital and the amount spent on fertilizers and feeding stuffs, bears in fact a direct relation to the amount of production per acre. The agricultural ladder for the vast majority of farmers is to-day to be

¹For example, although I am Professor of Agricultural Botany I do no routine teaching myself, but I always like to keep in touch with the 'Short Course', to whom I occasionally lecture for the stimulation I myself derive from association with a band of young men who come from the land and who, almost to a man, will be returning to the land.

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scaled not so much, or by any means necessarily, by becoming the proprietor of progressively more and more acres as by the use of more and more scientific methods, and by the intensification of the acres (up to a reasonable maximum, of course) of which a man is possessed. That is what the application of science to agriculture is making inevitable: to use science properly we want a great many (in fact the optimum number) of managerial brains at work—planning, scheming, devising. For every district, and considering the interests of the country as a whole, there must be an optimum size of farm and, given local contractors or co-operation between farmers, that optimum (and I am talking about farming) I think always stands above 20 acres and most usually below 100 acres.¹

In saying all this I must make it clear that I am thinking more about the conditions of to-morrow as I see them than of to-day. This is important, for in drawing up plans, that will leave their mark on rural life and farming for many generations to come, it is futile to organize solely on the basis of the conditions which obtain when the world at large has a high temperature and when the pulse of humanity has lost its rhythm, and we must make proper allowances for the rapid developments of science. There is scope for much psycho-therapy relative to the body politic. Assume a normal temperature and assume a normal rhythm, and act as if both were normal, and normal very soon they will be.

We want as carefully as possible, as gently and kindly as possible, to draw selected sons away from their fathers. I believe, for example, that if I could choose my own men from the ranks of our old Short Course students, and if I could choose my land, and if somebody would put up the capital, I could establish groups of farms *de novo* in hilly districts, on an economic basis and to the greatest possible national advantage. The number of such groups that would be possible, having regard to the limitations set by land of this sort, would be strictly limited—but the influence of such groups on hill farming would be very great. As an experiment in land settlement I should like to see at least

¹The optimum number of managerial brains must be determined by the size of farm that is sufficiently large to give full scope to the ingenuity of an able proprietor.



Isolated hill farm

AGE IN RELATION TO APTITUDE

one hill group set up. It would seldom, if ever, be feasible to establish more than 4-6 farms in one group. The plan would be to arrange the homesteads as close together as the configuration of the land permitted. Each homestead would be provided with 60-80 acres of intaken and cultivable land and with about 150-200 acres of hill—a considerable proportion of which should be improvable. Road facilities would be provided, shelter belts planted, a telephone call box centrally placed, and the holders would co-operate in the matter of implements and marketing. Speaking without having made a critical survey with a view to action, I feel fairly certain that such a group could, for example, be established at the head of the Usk, very largely on the land recently acquired by the Swansea Corporation to which reference has previously been made.

Land settlement is an extraordinarily complex problem; size of holding in relation to type of production and orientation of the holdings in relation to the type of land are the basal and fundamental considerations. The farmer—the livestock and farm crop man—must have a sufficiency of elbow-room, but no matter what size the holdings (1 acre or 100 acres) every well orientated group of holdings producing the same class of products should standardize such products and be assisted by a well conceived system of co-operative marketing.

CHAPTER XX

A First Proposal

State aid to agriculture; subsidizing land, not commodities. Land improvement and more production; importance of fresh food. Nationalism in regard to the land. Need of a fresh industrial outlook. Importance of owner-occupation. Yeomen farmers and small holders. Facilities for derelict estates; scheduling of these estates. Owner-occupiers; advances for stocking and improvements. State mortgages. Scheduling of derelict areas; appointment of District Commissioners. Grants to County Agricultural Committees; purchase of seed and fertilizers in bulk.

Because, as I have been at pains to emphasize, the land is ultimately the property of posterity, any durable policy for agriculture must be based primarily on the needs of the land itself. I adhere the more rigidly to this view because I am convinced that the difficulties and problems of any particular period of time are rendered easy of solution in exact proportion as we attempt to face them in terms of the future—as far as human minds can envisage—rather than in terms of the embarrassments of the moment.

A policy for agriculture, in order to react favourably on the land, and to succeed, must be based on the recognition of the cold fact that a very large proportion of our farmers, and especially those on the poorer lands, if not actually encumbered, are devoid of adequate working capital.

State aid to agriculture to-day takes many forms, so many forms indeed that it would almost seem that the nation at large is perhaps in a mood to tolerate experiments being conducted in directions that have been thought impracticable or even immoral. I was very impressed by the arguments put forward by Professor J. A. Scott Watson in a paper recently read at the Farmers' Club in favour of direct subsidies rather than all

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manner of indirect methods of helping the farmer. I would, however, wish to go further than Professor Watson and seek to subsidize the land rather than any particular commodity which it produces. The land can, I think, only be subsidized by two methods, and by two methods which could be put into operation concurrently. Both methods, of course, are fraught with dangers and difficulties. In the first place, the farmer must be provided with working capital on easy terms, and in the second place, he needs to be assisted in the conduct of his land-improving operations—he needs to be assisted in money and in kind. Where land improvement is most necessary, I believe a system of subsidy in kind is to be strongly recommended.

I am, of course, aware that land improvement and enhanced productivity mean extra production, the bugbears of flooded markets and falling prices. I do not think I need join serious issue with the economists, industrialists and internationalists. I would simply say: Does fresh food matter or does it not? Is the nation as a whole sufficiently fed or is it not? Does a healthy and vigorous rural population matter or does it not? If I did address myself to the economists and industrialists, and I cannot entirely resist doing so, it would be first to ask them to define a raw material. We must, it seems, only import raw materials to be worked up into finished products—food to be worked up into man, himself after all a raw material contributing to the manufacture of boots and shoes, for example. If we can only export boots because we import enough of something else, why should we not as a nation import all our shoes instead of quite so much food?

As a matter of fact I believe there is a great deal to be said for 'narrow' nationalism. If a nation sets out to produce within its own shores everything it possibly can for itself, that nation is going to give a gigantic stimulus to research, and research is the stuff of which the future is made. Export trade in the last resort depends on producing something mankind wants—on foreseeing and forcing the needs of mankind and being the first in the field in the production of the new commodities. That is in fact what this nation has done once, and it can hardly be denied that the initial vigour that put our colossal export trade in motion was derived from the land. True enough, of course, that by importing

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food we financed our customers, but the one fact is as true as the other, and causes rank higher in the evolutionary scale than effects. The industrialists, if they want to retain their status and their power, must now begin all over again, and produce a new and entirely unthought-of range of commodities so 'finished' and demanding such skill to manufacture that for a very long time we shall be able to buy off our would-be competitors and buy in our customers by importing such trifling things as wearing apparel and other less highly 'finished' necessities. This, our second industrial revolution, looked at from the point of view of narrow nationalism, will have the great advantage over our first, that we shall now be nursing a vigorous rural population of our own instead of maintaining and creating vigorous rural peoples in all parts of the world.

This is all beyond my mark. I cannot begin to understand either the international position or high finance, but least of all can I understand why either should be permitted to dominate this country's attitude towards the land. Until we have a really prosperous agriculture and our derelict acres are reclaimed, no man can say with certainty what the influence of that prosperous agriculture will be on our international trade, and upon our national wealth. I am all in favour of putting the matter to the test.

The modern state deems it moral to exercise unlimited eclecticism towards its citizens, both in the matter of acquiring revenue and in the matter of dispensing benefits. As a consequence there is no justification to-day for criticizing a proposal on the ground that such a proposal is based on eclecticism carried to extreme lengths. Nor is a proposal necessarily out of the question because to the timorous or to the biased it appears to present insuperable difficulties ; what is sufficiently desired is almost invariably possible of attainment.

The argument is freely put forward that it is impossible to finance or to regularize the activities of a very large number of individual proprietors, and consequently that small estates and owner-occupiers are in themselves a handicap to any considered schemes for the resuscitation of the countryside. If, however, prime consideration is given to the needs of the land and to the importance as such of a vigorous rural population, then, despite

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the difficulties, means should be sought as far as possible to encourage owner-occupation. When I say owner-occupation I am not thinking in terms of units of any particular size, but in units of all sizes. I should like to see the largest possible number of yeomen farmers in the old-time and best sense of the word—men of substance on broad acres; a large number of owner-occupier small holders and an appreciable number of landowners themselves farming by far the larger proportion of their estates. The basis of my proposal would therefore be to do everything possible to increase the number of owner-occupiers, and to do everything possible to assist owner-occupiers into a position of solvency. My first act would be to schedule two classes of the community: owner-occupiers and bankrupt landowners along with derelict estates in general and the tenants of farms on such estates. Having scheduled my two classes I would go much further than offer facilities. Both classes, if need be, would have to be compelled to accept facilities and to act in certain directions.

To take first the case of the derelict and bankrupt estates. The condition of the farms, of the buildings, of the land, and the general facilities would have to be considered. The State should be empowered as a last resort to effect a compulsory purchase on valuation. As an alternative a working plan for improvements would be drawn up and the estate, under a system of inspection, would contract to carry out the improvements on the basis of a strict schedule planned over a number of years with money lent by the State. On such estates rent control would be necessary, and there would be no question of raising rents on sitting tenants until after the lapse of a stated number of years. In cases where purchase was the only possible alternative, the aim of the State would be to re-condition the estate and then to sell off the re-conditioned farms one by one to the sitting tenants or to other suitable owner-occupiers.

Drastic powers would be necessary; it would have to be within the power of the State to schedule derelict or bankrupt estates; there would have to be an appeal tribunal. The tenants on any estate would be empowered, if say two-thirds of them desired to do so, to apply to the appropriate authority to have an estate scheduled as derelict or bankrupt. Landowners could

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also apply to have their estates scheduled, but the initiative to schedule would also be vested in the State. The State would have to be content with low interest and long periods within which to redeem the capital outlay. If purchase were necessary, the farms should not be sold off until brought into high condition, and until a fair purchase price was obtainable, while always the sitting tenant should be assisted to purchase, and on easy terms—long-spread-out repayments. The more derelict the estate, the greater would be the outlay necessary, and the longer would be the period of re-conditioning, but it must be remembered that the State, apart altogether from purchasing the land, is prepared to lay out about £9 per acre in the operations of afforestation (labour and materials) and to wait sixty or so years for any appreciable return.

With regard to owner-occupiers, and in order that advances could be made for improvements and for stocking, where the man was encumbered, the State would have to take over the mortgage. Often, no doubt, an owner-occupier is mortgaged beyond the present value of his holding; that would mean that the holding would have to be improved up to and beyond its mortgaged value in order that eventually the money expended could redeem itself.

Every owner-occupier who applied for a State mortgage and for a loan for improvements would have to agree to a plan of operations and submit to inspection. The mortgage, operation and stocking loan would be treated on the same basis, and every case would be worked out on its merits. In the case of hopelessly understocked and derelict holdings interest charges and repayments would be wholly deferred for maximum periods of up to two years, while as a means of subsidizing a class of farmer instead of a product the first year's repayments and interest might be written off (up to a certain maximum amount) automatically and in all cases as the equivalent of a bad debt.

The prime essential would be to give the man time and not to allow him to encumber himself more. An entirely different organization would be necessary from that provided under the provisions of the Agricultural Credits Act. For example, it might be necessary for the State to seek powers whereby it would automatically take over all mortgages on

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agricultural holdings, and whereby it could lay down a scheme of improvements to be adhered to over a number of years, providing the necessary capital on a sinking fund basis to be paid off along with the mortgage.

The essence of success would be to move slowly and provide ample time for an encumbered man to pay off his interest and principal charges. Improvements would be first put in hand where the outlay was slight and the returns would be immediate; the larger and more drastic improvements involving larger initial outlay would not be started till the man's incomings justified the increased loans.

The scheme should be tried out on an experimental basis, and with a view to this end a start might be made by scheduling derelict areas—say half a dozen. I know several areas that I would like to see scheduled forthwith! For each area a district commissioner would be appointed, and he would be based on the regional agricultural advisory centre. The commissioner would need to have at his disposal the best technical knowledge available.

A good and sympathetic commissioner with the knowledge and goodwill of the advisory centre at his back would probably make a sufficiently good start by persuasion. If this were not thought to be likely, he would have to be backed by compulsory powers in dealing with owner-occupiers and landowners alike, and a central arbitration tribunal would have to be set up.

Admittedly it is exceedingly difficult to provide facilities without further encumbering the persons it is intended to assist. Thus, if improvements on too generous a scale are put in hand in a district as charges on the rates there is a risk of rendering whole districts bankrupt. State credit schemes to agriculture have both failed and succeeded in the past—their best chance of success appears to be when arranged on a co-operative basis and when co-operation is strong within the farming community. The need is, however, so urgent that means must be found to overcome the difficulties, and that is why I advocate a start being made on a local and experimental basis. To re-condition the whole countryside would entail an enormous expenditure. The State must only stand behind an amount of re-conditioning that she can afford to finance on the basis of low interest charges

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and long-term periods for the completion of improvements and repayment of loans. To attempt to speed up unduly the whole process and in anticipation of the rapid repayment of loans would only be to court disaster.

There remains the question of direct grants in aid towards re-conditioning and improved farming, just as the Forestry Commission gives direct grants in aid for planting, and just as direct grants are obtainable towards the building of cottages. It is in this connection that I believe grants could be given to a large extent in kind—in seeds, in manures, and in the performance of operations, and such grants would, of course, be at the disposal of tenants and owner-occupiers alike.

In a previous chapter I have elaborated a plan whereby grants might be made to the County Agricultural Committees and use made of the county agricultural staff relative to contracting, and in the present connection I need only state that this would be a simple and effective means of subsidizing land improvement. A similar plan could be adopted relative to the production and the distribution of the necessary seeds. The Committee, through the Agricultural Organizer, could arrange for the placing out of contracts, or the purchase of seed in bulk—the seed to be passed to the farmer at a price not exceeding the cost of production and distribution, or at such lesser cost as might be deemed equitable as a further means of subsidizing land improvement. Help on similar general lines could be afforded relative to lime and fertilizers. It would of course be essential to ensure that State aid was only forthcoming in respect of operations and treatments absolutely appropriate to each particular set of conditions—hence the necessity of making the maximum use of the research and technical staffs that the State-aided scheme of agricultural education and research has brought into being.

I cannot believe that it would be more difficult to subsidize an ordered scheme of land improvement than to subsidize any particular product. A certain amount of centralized bureaucratic control would, of course, be unavoidable, but in so far as direct dealing with the farmers is concerned the whole organization should be regionalized and based on district commissions, the regional agricultural advisory centres and the County Agricultural Committees with their staffs. I have not attempted

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to make more than broad suggestions, but I am convinced that it would not be beyond the power of modern bureaucracy to work out the details for schemes that could be put into operation with the minimum of interference and the maximum of benefit to the land. Decentralization at the right stage would be the key to success and enthusiasm the germ to be fostered.

CHAPTER XXI

The Urban Population: Recreation

The influence and decline of the city horse and city cow. Covent Garden in the days of the horse. Urban recreation. Golf; super-golf and primitive golf. Number of golfers and of golf courses in Great Britain. Transport facilities and recreation. Acreage needed for playing fields. Cost of establishing golf courses and playing fields. Participation by urban visitors in games on the village green.

Steam was primarily responsible for the great cities of yesterday, and then came electricity and petrol, but aided still by steam, entirely to revolutionize town and city life. Apart from their responsibility for the creation of ever-extending suburbs, they have combined to make it easy for people living in the towns to go into the country for periods of only a few hours at a time. More than this, however, they have almost completely torn from the towns the last connecting links with the country—the horse, and with the horse a type of man who was himself a connecting link neither typically urban nor typically rural. The hostlers, stablemen, cabbies and bus drivers, carmen and waggoners at least devoted a considerable proportion of their time to a species other than man, and who can deny that the town in so largely losing the horse has also been deprived of a class of men who, though in the aggregate certainly not beyond reproach, nevertheless gave a something refreshing and definitely valuable to town life—because savouring of the country. None of us who as children remember the London bus driver and cabby can doubt, moreover, that the influence of those connected with the horse was out of all proportion to their actual numbers.

Unfortunately I have been unable to obtain reliable long-period statistics with a view to comparing the town horse population over a considerable run of years. The census returns for

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England and Wales are, however, interesting in this connection. Thus in 1901 'motor car drivers' were returned as 623; while the number of people more or less directly concerned with horses (other than agricultural horses)—that is to say, coachmen, grooms, cabmen, carmen, waggoners, proprietors and the like totalled 485,573. In 1921 there were 143,688 persons driving motors of one kind or another as an occupation, while the numbers concerned with horses (other than in relation to agriculture) had dropped to 233,228. These figures do not, of course, apply to towns only, and include grooms in connection with hunting and racing stables, but they are eloquent of the decline of the utilitarian horse and of the employment connected with it. At the time of writing, the figures for the 1931 census are not available, but to-day an occasional growler at a London terminus is all that is left of the cab horse and the cabby, yet but forty years ago there were over 15,000 hansoms and growlers in the metropolis.

The last decade has also witnessed a further and rapid decline in the use of horses for heavy haulage and light delivery in the towns. An enquiry undertaken by the Economics Research Institute at Oxford which covered three towns with a total population of 73,764 showed a decline of 34·5 per cent. in the horses used by thirty-five firms from 1919 to 1929. Twenty-one firms reported using no horses during the period, and eleven had turned over completely to motors prior to 1919. Further evidence of the steady and recent decline in the numbers of the city horse is given by returns collected in 1917, 1920 and 1924. In 1917 the total number of horses in Great Britain, excluding thoroughbreds and those used in connection with agriculture, was about one million and a quarter; in 1924 the number had fallen to 909 thousand odd, and this despite a rise in the number of hunters and of ponies and cobs of fourteen hands and over. During the same period light and heavy draught horses (three years and over) had fallen by nearly 20 per cent. The returns for 1934 show that although the total horse population of the country has fallen by 600,000 during the last ten years, yet here is no decrease in riding horses and hunters. The falling off in draught and van horses has been further accentuated and shows a reduction of 67 per cent. since 1924; while the

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number of horses used in agriculture has fallen by 13 per cent. during this period. In the case of towns with a population of 50,000 and over, only 3·9 per cent. of the horses in such towns in 1924 were devoted to the carriage of passengers, a proportion which has probably decreased considerably in the last ten years.

In one very important respect the motor, as is usual in the affairs of man, came just in time. In this instance it made it possible to satisfy the growing eagerness of an enlarging population to be less spot-bound, and to ensure the more expeditious distribution of a wide range of products which had come to be regarded as essential in a very large number of houses. Thus between 1891 and 1901 (the pre-motor decade) those engaged in the tramway services increased by 164 per cent., while waggons, carriers and the like increased by 61 per cent., and coachmen, cabmen and grooms by 13 per cent.

An earlier mark of the growing severance between town and country was the departure, though not even yet quite complete, of the dairy cow from the precincts of the city. At the present time there are few, if any, cows in London proper, but immediately prior to the outbreak of cattle disease in 1865 there were many hundreds of cows in London, and in those days there were extensive markets at Smithfield for the purchase by dairymen of cows in milk. It is strange, for example, to try to imagine the Edgware Road and Paddington districts with 550 cows, Shore-ditch with 200, and so on. From the point of view of modern standards relative to milk, the practices of those London cow-keepers appear to have left almost everything to be desired. Water would seem to have been the chief ingredient, special pumps—the 'black cows'—being employed for the purpose of adding abundance of water to the vessels containing the milk. Such practices were apparently quite general and were conducted openly at the sole discretion of the cowkeeper.

Liverpool and Glasgow still have licensed cowsheds within the city boundaries, but the great majority of these are actually on farms on the outskirts of the city; the tendency now being to eliminate small cowsheds in the city itself. In Glasgow to-day there is in fact only one byre cowshed without grazing facilities.

These changes connected with cow (and never mind the quality of the milk) and horse I am convinced have meant a vast

COVENT GARDEN IN THE DAYS OF THE HORSE

deal in the evolution of the urban psychology of to-day, which, like the towns themselves, is mechanized. A little leaven influences a very large loaf. Well I remember in 1907, when I was a pupil on a large market garden in Kent, driving up with the night load, twenty odd miles, to Covent Garden. A grand team of horses, the waggoner himself a competent ploughman and a countryman to the core. The early morning scene at Covent Garden was one not lightly to be forgotten, and of this I am certain, the influence of those country waggoners and their horses coming daily to London was every bit as great on the Londoner as was the influence of the Londoner on the waggoners.

These changes have been so rapid that the post-war generation now in harness can hardly realize what has taken place, and cannot be expected to begin to appreciate the significance or the completeness of the divorce between town and country.

The country and the atmosphere of the country no longer come to the great cities, and for that matter little enough to the smaller towns. To-day the townsman must seek the country in the country. We must, however, and at this juncture, distinguish very clearly between exercise and games on the one hand, and the enjoyment of the country on the other. Exercise by playing games demands numbers and demands facilities in or near the towns so that crowding is a necessity.

The enjoyment of the country should be leisurely and, to be of full tonic value, should be sought in the absence of crowds, and it is this that makes the provision of facilities in the country for the urban holiday-maker a matter of such great difficulty. Before dealing with this latter aspect of urban recreation, and I intend doing so at some length, it will be convenient if in this chapter I express such views as I hold relative to games and playing fields.

I will start with golf, which serves as a kind of connecting link between the enjoyment of the country and the enjoyment of a game. In saying this I am not disparaging golf as a game, but I do say that it is possible to play golf in a leisurely manner and at the same time to enjoy the beautiful and ever-changing scenery amidst which golf courses are so frequently set. I would distinguish between what one may describe as super-golf and primitive golf. Most of the golf of to-day is super-golf—an expensive game for the few to the accompaniment of luxurious

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club houses, long, superbly kept and difficult courses, far more clubs than the player can himself carry—more than a caddy should be asked to carry. Super-golf is very much to the good, it affords employment in the country and usually at higher rates of pay than those of agriculture. An eighteen-hole super-course is likely to employ a head greenkeeper and about five men; the average weekly wage of the former will be from £3 10s. to £5 10s., and of the latter 45s. to 50s. Golf courses, too, contribute their quota, a no mean quota, to the local rates; the rateable value of many courses is from £3 to £5 per acre.

The construction of super-golf courses affords considerable employment, the cost varying probably from about £3,000 to £6,000 according to the type of land and the character of the course required. The acreage devoted to a golf course varies from about 100 to 150 acres, but 100 acres is required as the minimum for a modern course of about 6,200 yards in length.

To-day the position as to golf is briefly as follows. In England there are about 1,200 courses, of which perhaps nearly 200 are nine-hole and artisan courses. In Wales there are about 118 courses, of which only 57 are full courses. Scotland has 300 courses, about 50 of which are small. The number of municipal courses is 128 for England, 5 for Wales, and 53 for Scotland. It is only possible roughly to estimate the number who play golf by the number of members of the clubs. This does not, of course, include artisan and 'municipal' players, but includes non-playing club members. The numbers are, for England and Wales 312,426, and for Scotland 109,639, and to these figures must be added about 119,600 women players for Great Britain as a whole. These figures show the greater popularity (per head of population) of golf in Scotland than in England and Wales, but more striking is the fact that in Scotland there is a municipal course to every 91,000, and only one to every 310,000 in England. The whole point is the smallness of the number of people in England and Wales who play golf in relation to the population—it is manifestly less than 10 per 1,000. The National Playing Fields Association base their proposals on a game-playing population (ages 10 to 40) of 350 persons per thousand of population. Golf, it is to be noted, accepts no age limit for its devotees and is an admirable game for maintaining the hard worked middle-

GOLF ; SUPER-GOLF AND PRIMITIVE GOLF

aged in health. It is looking at the matter in this way that forces upon my mind the need for an altogether greater provision of facilities for golf, but the facilities must be cheap, and the golf therefore primitive. I think there is no doubt that saturation point has been reached, especially around London and some of the midland industrial centres in the matter of super-golf courses.

Primitive golf in my meaning of the word is catered for but little. Most of the municipal courses are of a higher standard and demand more expense in up-keep than I believe to be necessary, or in the interest of the maximum number of would-be primitive golfers.

My sole aim in providing facilities for primitive golf would be to make it as cheap as possible per playing round. New rules might be necessary, a severe limit put to the number of clubs permitted (say a maximum of four), it might be desirable to revert to the gutty ball. Hazards would be reduced to a reasonable minimum, the greens would be well kept but not unnecessarily large, the fairways broad rather than of superlative texture.

With modern transport facilities it should be possible to organize the transit of artisan and low-salaried town workers very considerable distances at specially cheap rates to play weekend primitive golf. What I want to cater for is the completely out-of-town recreation of the maximum number of people and to herd these people together as little as possible. Golf is unique in this regard, large numbers of people can be spread over a golf course to enjoy themselves *tête-à-tête*, to enjoy the game, and to enjoy the scenery. The facilities must be provided *in toto*, the primitive golf courses, the cheap clubs (four in number) and cheap transit, before the idea of primitive golf can be popularized and made a reality to benefit not the hundreds but the thousands.

It need not cost anything approaching £3,000 to construct a primitive golf course; I am sure that, by the adoption of the type of methods I have discussed in connection with the improvement of grassland, in most cases about £900 would be a maximum figure. Club-houses in the ordinary meaning of the word would be unnecessary—pavilions where people could change their clothes and eat their sandwiches would be sufficient.

If primitive golf became a craze like the cinema and dog racing, the demands for such courses might become exceedingly

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heavy, possibly one course to at least every 5,000 inhabitants. If we assume a demand at the rate of only one course per 20,000 head of population, and only allocate 80 acres per course, this in England and Wales would necessitate the provision of 159,760 acres, and give a considerable amount of employment to legislate for. This very conservative estimate of the possible needs would, however, more than double the acreage now devoted to golf in England and Wales, and therefore care would have to be taken not to use good agricultural land for the purpose.

It must be remembered that I am not thinking in terms of the immediate future, but in terms of the unprecedented changes that are only beginning to unfold themselves—shorter working hours, a revolt against the narrowness of town life, and eventually, and probably quite suddenly, a trade boom the like of which no man has yet envisaged. All these things are inevitable, provided only man will not lose faith in himself nor lose faith in the fitness of things.

I repeat that the great merit of golf is that it takes people right out of town into beautiful scenery, and can be enjoyed *tête-à-tête*, and therefore has a great deal to offer as an antidote to the mass psychology of modern town life—and it is a recreation for the middle-aged. Moreover, once provide the city worker with week-end golf and he will have a new purpose in view when he takes his annual holiday, and this possibly too must be considered in relation to the setting up of primitive golf courses.

The ordinary games—football, hockey, cricket and tennis for the young and relatively young, and bowls for those of more mature age—must necessarily be provided for within or not far away from the 'city walls'.

As I have said in an earlier chapter, it is impossible to estimate the acreage actually provided for games at the present time. On the basis of the standard accepted by the National Playing Fields Association in relation explicitly to the proven needs of to-day, not less than seven acres should be allocated to every 1,000 of the population. In many cases grounds maintained by private clubs, schools and the large firms account for three acres, leaving four acres to be provided for by the public authorities. This must be regarded as the minimum need—a need which is

ACREAGE NEEDED FOR PLAYING FIELDS

bound to be exceeded when the working week is further shortened, and when the revolt against the crowded life of the towns has had time to widen, so that if we look a little farther ahead, it is not unlikely that ten acres per 1,000 head of population will soon be the ideal to be aimed at, and this for England and Wales would demand in all 399,480 acres, or, with the additional golf courses which I have postulated, well over half a million acres devoted to games.

In order that the maximum use may be made of playing fields, organized transit facilities at the cheapest possible rate are of equal importance to the provision of the fields. Given the transit facilities, there is I think much to be said for the playing grounds being some distance from the scene of a man's daily labours, and especially if the working hours are spent in sordid surroundings. The more an air of spaciousness can be introduced into the recreational hours of mankind, so much the more will people realize the blessings and psychological benefits to be derived from leisure used to a definite purpose. I think, therefore, that there is everything to be said for a green verge of playing fields and open spaces surrounding as far as may be possible the 'city walls'—indeed such a verge should perhaps constitute the modern equivalent of the 'city wall'.

Sixteen million people, it is said, attend the cinemas of Great Britain every week! Surely no effort should be spared to endeavour to induce people to do something original themselves rather than, or at least as well as, watch the antics of other people—and the other people not real at that. To play any game makes at least some demands on a person's originality and personality—he is afforded a choice of alternatives in dealing with the various openings that are presented to him.

To provide the necessary facilities for games gives healthy and out-of-door employment at a high ratio of labour to total cost—labour will often stand to material in the ratio of 80 per cent. to 20 per cent.

The costs per acre are heavy and vary over the widest possible margin in accordance with the character of the land—often in itself most unsuitable—that is available to be converted into a playing field. It will take perhaps £1,000, perhaps £5,000 to lay out a five-acre ground. Tennis courts will vary in cost

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from about £120 to £300. A bowling green laid with sea-washed turf would cost anything from £600 to £800, or even more.

Supplementary ground suitable for young people or for 'primitive' games could of course be provided more cheaply. Under certain conditions £70 might provide a tolerably good tennis court, while in rural areas in particular a great deal of pleasure is derived from playing cricket, and even tennis, on 'pitches' that have scarcely been made at all. Often indeed it is the paraphernalia that constitutes a greater difficulty than the ground upon which to play.

In recent years in the rural districts of Wales of which I have direct knowledge there is a growing keenness for games—and even for cricket—and every little primitive club that is started leads to the formation of another. In the fostering of games in village and hamlet, I foresee great possibilities in the all-important direction of bringing town and country people into closer contact and into greater harmony with each other. To an ever-increasing extent the urban cyclist and hiker finds his way into villages and off the beaten track, pitches his tent or finds a lodging where he can. Such visitors—and they frequently move in considerable numbers together—should be attracted towards the village green (or its equivalent) and join in friendly cricket or primitive tennis with the inhabitants.

A start is what is wanted; a little hard thinking and discussion between rural and urban associations. I could imagine a particular Ramblers' Club having the same sort of association with a particular village that so many of the Oxford Colleges have with sister colleges at Cambridge. Hospitality would be returned—in the summer the ramblers would join in the activities of the villages; in the winter the villagers would be entertained in the towns. Once started, and with gradually increasing village facilities for games, and when prosperity returns to the countryside, it is along such lines as these that the townsman and the countryman can be brought to appreciate each other's virtues, and to understand each other's shortcomings, and finally to share each other's hopes and fears. Only when all the people of a nation share the same hopes and the same fears can the genius of that nation reveal itself in creative enterprise of the first magnitude.

CHAPTER XXII

The Urban Population in the Country

The country no longer the prerogative of the few. The pilgrimage of the twentieth century. Youth hostels and rambling clubs. Handbooks for ramblers. Fishing; increased facilities. Riding; bridle paths. Trade Guild (Holiday) Estates; powers of purchase. Guild Farms. Week-end allotment associations. The psychological influences of a subsidiary income. Market stalls. Crafts. Literature and the country.

TO appreciate to the full the beauties and pleasures of the country a person needs to do something in the country. This, as I have said, is one of the reasons why I am such an uncompromising advocate of golf for the urban worker and why I am so anxious that the hiker and the cyclist should join in the games on the village green. The much more difficult and altogether more important problem is how to bring the urban worker into intimate contact with the essentially country pursuits, with farming and the care of woodlands, with the horse and the sports of the country.

No longer can the country be the prerogative of the few—that happy time for the favoured few has definitely ended; it is useless to resist. The large farmer will steadily and relentlessly be shorn of his redundant acres; private shooting and private stretches of river will almost become things of the past. Those of us who have been accustomed to motor, to walk or to ride over great stretches of lovely country with the certainty that all day long we should meet no other human being save perhaps a shepherd with his dog have now, if motoring, to be on the alert everywhere, even where we had thought that it was only ourselves who could take a car. The bicycle has penetrated to all our haunts, and the hiker now hikes where previously only we had walked. We who have loved the country and who have been

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so greatly privileged to have it so long to ourselves should be the first to welcome the new-comers. We should rejoice at their good sense, and instead of violently criticizing their lack of country manners—litter, open gates, flowers ruthlessly plucked—we should endeavour to educate them in the ways of the country, and afford them all the facilities and hospitality in our power, for country folk were ever hospitable folk.

The pilgrimage of the twentieth century has begun, and nothing can stop it because it has behind it the momentum of dire necessity. The full significance of this pilgrimage must be realized in time, and the needs of the pilgrims catered for to the full and in time—as yet the pilgrims themselves hardly know what it is they are seeking for, at present they are seeking rather an escape than a goal.

A number of associations exist for helping the pilgrims into the country, but for the most part little is done in the direction of cultivating a sense of country-mindedness in the pilgrims, and having taken them into the country making them also in some small degree of the country. The first essential is to cater for the thousands of urban workers who have already wakened up to the fact that there is such a phenomenon as rural England and who, at all events in passing towards an urbanized resort or well advertised and partly unbeautified beauty-spot, are desirous of lingering in the country.

The foundation of the Youth Hostels Association (England and Wales) was an act of pure genius, for here is an association that in my view stands behind what will prove to have been the most fruitful human tendency of this century, and one that is pregnant with beneficial possibilities in its influence on the mental tone of those who are compelled to live in the cities. Founded in 1930, by 1932 the membership of the Association was 16,914; by 1933 it was 27,905. In 1933, 183 hostels had been established, and accommodation had been provided for 157,582 bed-nights. The number of hostels is now 228 in England and Wales, 44 in Scotland, and 10 in Northern Ireland.

The Cyclists' Touring Club, with a membership of 30,164 (in 1933), has also done a great deal to popularize and cater for those desirous of lingering in the country. Of the apartments registered for sleeping accommodation the majority are in rural

YOUTH HOSTELS AND RAMBLING CLUBS

and semi-rural districts. The Rambling Clubs and the Federation of Rambling Clubs, which latter publishes an annual year-book, are also doing invaluable work.

All these agencies are, however, primarily concerned with the mere taking of holidays in the country—air, exercise and the beauties of the country. Interest in the country can be centred either upon the archaeological and historical, the geological, the natural history of the country, or the pursuits of the country. At the present time I think most interest is shown in the archaeological and historical—such points of interest have been well scheduled and described. I think there is much scope for the associations standing behind the great pilgrimage fostering a keener interest in all aspects of the country. There is need for a complete series (pocket edition) of 'Ramblers' Companions' arranged on a regional basis, the subject matter being dealt with from the strictly local point of view. There would be separate little books on the agriculture and rural customs of each region; on the bird and animal life; on the geological and physical features, and on the vegetation. More should be done also in the direction of arranging winter lectures on all the topics of the country. First, get into the country; second, take an interest in everything to do with the country; third, take part in a country pursuit.

Of the sports of the country perhaps fishing is the one most generally indulged in by the urban worker. For example, of the athletic associations fostered by the companies which now comprise the London Passenger Transport Board several include an angling section. Many of these do not find it necessary to hire private waters, but fish in rivers, public waters and reservoirs within a thirty-mile radius of London. Other sections prefer private waters, paying rentals varying from £10 to £35 per annum. One site is Stockers Lake off the Grand Union Canal near Rickmansworth, another is in the Cornmill stream at Waltham Abbey, and a third is a private section of the river Colne. The type of fish varies with the site, but bream, roach, dace, pike, perch, eel, trout, tench, carp, dab and barbel are caught. It is probable that about 1,500 members of the staff of the London Passenger Transport Board may be classed as anglers.

It would be possible with the aid of research and careful

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stocking to increase the fishing facilities of the country; with this in view certain reaches of our canals so long fallen into disuse might well be stocked with fish. Fishing, I believe, will become more and more a holiday pastime of the urban worker. It is a pastime which the medical profession ranks above all others as curative for the overwrought, and it is conducive to contemplation. The amount of fishing all over the country made available to the urban worker must be enormously extended—of which presently.

After fishing—as a recreation of great curative and psychological value and as one that could be provided on a telling scale for the urban worker—I should place riding. Riding on relatively cheap, cheaply fed rough ponies. I must emphasize, that I am not so much writing about to-morrow in the sense of 1937 or even 1950, but I am thinking all the time of the great to-morrow that will dawn when the nations have learned to laugh at their fears and lack of faith in themselves and in each other and at the futility of inviting war by preparing for war, and will have turned their energies to inviting world-wide progress and prosperity by preparing for the certain consequences of an unprecedented trade revival—shortened working hours and wages on a scale that would have staggered and dumbfounded even the most enlightened industrialist of the pre-war period.

The pilgrims possibly of even 1975, but I think almost certainly those of 1999, will have time in which to enjoy the country and money to spend in the country, and I hope and think that riding will then become more general, far more general, than hiking has yet become. To prepare is to invite, and to invite with sufficient tenacity and assurance is to succeed!

The bridle paths of the country must be tabulated and improved, and new paths made. Before very long the more favourably placed of the Youth Hostels will be making provision not only to house the youth but to bait his sturdy hired pony. The number of riding schools that have sprung up all over the country is an unmistakable finger-post to one of the many roads which will together constitute the pilgrims' way.

There remains agriculture and the life of the country, and also there are further and very definite means of providing for pastimes in the country; and now I have reached the very

TRADE GUILD (HOLIDAY) ESTATES

core of my subject and have three concrete proposals to make. I want to see Trade-Guild (Holiday) Estates, National Parks, and Week-end Allotment Associations set up all over the country. What precisely do I mean? I will endeavour to explain and I will deal firstly with what I regard as the most important of my three proposals—the Trade-Guild (Holiday) Estate.

The purchasing by a great business concern of an estate for the benefit of its employees would not differ in principle from the providing of playing grounds, or the financing of a number of benevolent funds. On the grounds of principle and equity it is always particularly appropriate when a generous magnate gives of his wealth to assist those within the particular industry from which that wealth has been primarily derived. I am introducing no new principle, for the employees too have long contributed to their sports associations. Perhaps, however, in order to found Trade-Guild (Holiday) Estates on a sufficiently generous scale it would be desirable that each of the great trades and industries, rather than the separate combines and companies within each industry, assumed responsibility in this matter. It is because I think that the whole of an industry should co-operate and act in a corporate capacity that I have introduced the word 'Guild'. Then it would probably be easier to standardize a definite levy on profits towards the necessary funds, and perhaps a graded scale of levy on salaries and wages. While if the industries took corporate action it would facilitate the introduction of such legislation as might prove to be necessary in order to carry the scheme to full fruition. For example, it should be possible, when a sufficiently good case can be made out, to seek compulsory powers for purchase, just as it now is in the case of say municipal waterworks, railway and dock extensions, and the like. Here of course is an extraordinarily important matter of principle, and it will arise equally in the case of establishing national parks and week-end allotments. My principle is that in the national interest facilities for proper holiday and leisure are just as important as facilities for either an abundant water supply or for the expansion of an industry.

My immediate concern is not so much the question of the acquisition and general administration of the estates—details concerning which there is ample experience available to guide

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wise action—but the question of how to organize to the best advantage the resources which the estates will make available. The endeavour must be to provide for games, rural recreations and a country atmosphere for as large a number of people as possible per estate, but in doing so the estate must not be urbanized or converted into a gigantic park (in the city sense). The mansion would be converted into a hostel, a cottage hospital for convalescents would be erected. As far as possible annexes would be built on to all the farm-houses, and a large number of cottages would be erected. Well arranged camping sites would be provided. All of this would be planned in strict relation to the size of the estate and to the configuration of the land itself and of the woodlands, and there would be no unsightly or urbanized over-crowding. A primitive golf course would be laid out, and an ample playing field. The further aim would be to maintain the whole estate in the highest state of efficiency. The home farm would be farmed by the Guild itself, in the most scientific and up-to-date manner possible—every endeavour would be made to bring the farming of the tenants up to the same high standard. The tenants would, of course, be under an obligation to allow Guild members over their land and to submit to minor restrictive covenants, and therefore would have to be treated generously in all respects. A system of co-operative marketing for the estate as a whole would be inaugurated, and it is probable that ultimately the system would be carried right back to the factories where the members of the Guild were employed. The sporting rights would be retained and the sporting facilities developed to the maximum. A considerable string of riding ponies would, of course, be kept. A fair-sized estate would be able to cater for at least 500 Guild members at a time.

Like almost every proposal I have put forward this idea could be tried out on an experimental basis, and to experiment is probably more than anything else the paramount need of the present age. Until experiments are started it is impossible, for example, to prognosticate how many employers per 1,000 would desire to avail themselves of these rural facilities, or in what precise form facilities should be offered. At first there would be great difficulties; probably a very large number of shooting and riding accidents, and many abuses arising out of ignorance.

Some of the Guild members might desire to take an active part in work on the land, and with goodwill all round this could be arranged for within certain limits. If, however, the underlying aim is a correct aim and in harmony with modern tendencies, there is no doubt that all details could be satisfactorily worked out and all difficulties overcome. With large numbers wishing to use the facilities, it would be necessary to extend the period over which holidays are normally taken, and to cater largely for week-ends, and this throughout the year.¹

The chief aim of the Trade-Guild Estate to my mind should be to bring the urban worker into closer contact with the country and with the countryman. This is one reason why I regard it of great importance that the Guild should itself farm the home farm, and in doing so also endeavour to give a lead and an impetus to the farming of the district. As I have already said, I am strongly in favour of owner-occupation and am averse to company farming *qua* company farming. The Guild farm would, however, be very different; the management would aim to live up to the best traditions of the landlordism of the past, giving 'countenance to improvements in Agriculture and steering clear of the pedantry of it', and would be for the benefit of the estate as a whole. The tenants (because true countrymen) would be

¹Eventually, of course, the question of the calendar will have to be courageously dealt with. The week-end has already become an acute problem, and it will soon be quite impossible to provide facilities for all at the week-end; the enjoyment of everybody will be ruined, and Saturday and Sunday will become—as on the roads they already are—the most nerve-racking days of the whole week. The only plan would seem to be to regard all days as of the same denomination. It may ultimately be necessary to divide the year into forty nine-day weeks, and one five-day (six-day in leap years) week. The five-day week would be in the summer, and as far as possible a holiday week, and would take the place of the present scattered Bank Holidays. The normal nine-day week would provide six working days and three days off—there would be no official week-end, each day would be a work day for some and a holiday for others. This question of the calendar and the working week—an official week-end or no official week-end—is, of course, bristling with every kind of difficulty, and the whole question is as controversial as ever it can be. That is why I merely draw attention to it in a footnote. My conscience will not permit me entirely to ignore it because I believe it to be one of the greatest, if not the greatest, of the problems that will have to be solved during the present century, and on the correct solution must depend almost everything which I hold most dear

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a very important feature of the estate, and it would be to undermine the whole purpose of the Trade-Guild Estate for the Guild to take over and manage all the farms on the estate as they became vacant, although little by little colonies of small holdings might be established for members of the Guild who discovered in themselves an unquenchable eagerness for rural life, and for those who, on the grounds of health, should live in the country. To associate big business and the employees of big business thus closely with the country and the interests of the country would, I am convinced, be of great psychological value to big business, and of great benefit to the countryside, and therefore of far-reaching national consequence.

No living man can be expected to draw up an ideal and watertight scheme and at the first intention: success can only be born of trial and error. My proposal is not in essence new, it is probably to-day impossible for anybody to make an entirely new proposal which has also about it any reasonable measure of practicability. Will not some one or two of the dividend-paying industries—the chemical and the tobacco, for example—greatly daring embark upon this great experiment?

I will conclude this chapter with a few remarks relative to week-end Allotment Associations, and devote the whole of my next chapter to the question of national parks. I am not in the present connection directly concerned with the unemployed, but with country recreation for those in regular employment. There are two important aspects to allotments: that of subsidiary income (in kind or in money, or in both) and the healthful pleasure to be derived from handling the soil. I think the psychological influence of a source of income subsidiary to the salary or wage earned in a man's regular employment is considerable, while if the method of acquiring the subsidiary income is not too exacting, is honest, and does not interfere (in time or mental poise) with the energy, enthusiasm and competency available for the daily tasks connected with the regular income, then I am convinced that the psychological influences are greater than the actual material gain. For example, in the unlikely event of the reading public reimbursing me in proportion to the time and thought I have devoted to this book, the periodic cheques I should receive from my publishers would add to my

WEEK-END ALLOTMENT ASSOCIATIONS

sense of independence and 'affluence' out of all proportion to their size. It is the sense of independence more than anything else that I think needs to be inculcated in every human being if he is to be purposeful and happy, and a stalwart citizen.

The normal allotment is not very large, and is an evening allotment in the sense that it is usually near enough to a man's home to be reached after work—and strictly speaking it is not in the country. With a shorter working week and if each allotment was maintained by a group of three or four individuals, I see no reason why Allotment Associations should not be set up right in the country—the actual distance (ten or even twenty or more miles from the city street) would be determined rather by transport facilities than by the mileage. The Allotment Association would be organized on co-operative lines throughout. Not only would it be necessary for each allotment to be conjointly cultivated (by men having their day off on different days of the week) but all of the allotments would conform to a well regulated plan relative to the commodities to be produced, and the marketing would be centrally organized. In connection with all types of allotments there is a great deal to be said for the 'market stall' conducted on very much the same lines as those which have proved such a success under the auspices of the Women's Institutes. My wife, and the wives of a number of my colleagues in the Agricultural Department at Aberystwyth, assisted by other staunch Women's Institute members, despite much initial opposition in the town, have been prime movers in the inauguration of a very successful weekly (Saturday) stall in the summer and autumn in Aberystwyth. The gross sales in the first year (1932) were only about £180; in the second year (1933) they were over £700, and in the third year (1934) they had risen to the substantial sum of £1,564. The stall has been a great benefit to small producers in remote parts of Cardiganshire, and has owed much of its success to the insistence upon proper grading and to the fact that amongst the above-mentioned wives there have been knowledgeable and competent graders—the educational effect of this proper grading has reached into the remotest corners of the county. I mention this case because it illustrates so well what can be achieved by organization, and because it demonstrates so completely the absolute necessity of skilled

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grading, while incidentally I am sure of my facts, for by virtue of my Department's connection by marriage with the stall I have been kept particularly well informed of all the trials, troubles and successes which have been encountered.

To return to the Allotment Association. In these days of movement a well organized stall *in situ* would probably attract its own customers, though such a stall would probably need to be supplemented by other stalls in the towns. The allotments would be of a generous size, and poultry as well as horticultural produce would come within the scheme. When the working-leisure week has become properly departmentalized and the 'off' and 'on' days judiciously interlaced for all the employees in a factory, it may well be small holdings rather than allotments that will form the nucleus of the Association. Again, and obviously, I cannot fill in all the details; two points must, however, be mentioned. In the first place, where Trade-Guild (Holiday) Estates are near enough to the large factories and centres of population, Allotment Associations could be advantageously developed in connection with such estates. In the second place, there is the all-important question of shacks with sleeping bunks and of a central canteen, and consequently an Association planned on the lines I am advocating would need to employ a few permanent custodians.

The great pilgrimage must of course create its own demands as it gains in strength, and unless these demands are anticipated and feelingly and sympathetically catered for, woe be to the countryside and woe be to the nation. We want a great architect to arise, himself a great countryman, a man imbued with the urge blindly struggling for self-expression that is the driving force behind the great pilgrimage, to design thoroughly appropriate and rural shacks, modern, but rural cottages; to consider the colour schemes appropriate to Dutch barns and farm buildings; to ponder and advise relative to the lay-out of allotments; to harmonize the poultry house and chicken pen with its surroundings—to be THE ARCHITECT born of THE NEW AGE.

This brings me to a brief consideration of crafts, which at first sight may not appear to be essentially of the country. Craftsmanship was emphatically born of the country, and probably could be encouraged and fostered to the greatest advan-

CRAFTS

tage amidst rural surroundings. I believe, therefore, that week-end Allotment Associations should provide workshops and cater as much for the craftsman as for the cultivator: the Trade-Guild (Holiday) Estates should also afford facilities for the craftsman.

All that I have brought forward in this chapter primarily presupposes a shortened working week, and is for to-morrow. Much of what I have said is, however, in essence applicable to the conditions of to-day, and is not without a measure of application even to the immediate problem of the immediately unemployed.

There is nothing inherently new in any of the proposals I have made, unless possibly my bracketing together the tonic value of the country and the psychological value of a subsidiary income. I want the subsidiary income to be earned in the country, and for the reason that a healthy method of deriving a subsidiary income must be a creative method. There are three creative methods open to every citizen, or which should be made open to every citizen. He can produce something (a fruit of the soil). He can ~~make something~~ (an article of artistic craftsmanship), or he can ~~think something~~ (and commit his thoughts to writing). The market for the written word has never been so great as it is to-day; the markets for the products of the soil and for articles of artistic craftsmanship are potentially enormous.

If I mistake not the meaning of the great pilgrimage and the force behind it, and if I mistake not the influences of the country and of contemplation on the mind of man, then the new age has in fact dawned. The literature of an age can alone speak for that age, and I believe the literature of the twentieth century will show contrasts of a profounder significance than any the world has yet witnessed. The literature of the closing decades will be that of the working man, released at last from its shackles, full of faith because born of justice. How different from that of the earlier decades born of doubt and of dread, with its introspective and morbid searchings and disbeliefs.

CHAPTER XXIII

My National Park

What is a national park? Agricultural activities. Brief description of my park. Roads to and within the park. Description of roads and tracks. Agricultural improvements and afforestation. Parent and filial farms. The Central village. Sites for hostels and camps. A permanent boarding school. A 'guide' book. National parks on our coasts. Employment in national parks.

By a national park I envisage a considerable area of country where facilities are provided for large numbers of urban workers to remain for appreciable periods in the country and amidst truly rural surroundings. A national park should not be a piece of country just to be looked at; not merely a bird and natural vegetation sanctuary; a place where the tourist is not expected to remain and where he is urged by innumerable notices to be on exceptionally good behaviour and in general to 'keep off the grass'. If facilities are to be provided, building and road-making on a considerable scale will be essential: provision must also be made for riding and fishing. A national park, if it is to serve a really useful purpose, cannot be left wholly in its wild condition: the provision of accommodation for visitors would necessarily also render essential the planting of trees. More than this, it is desirable that every endeavour should be made to improve and heighten the intensity of such agricultural activities as may be possible within the area of a national park. This, both in order that the urban workers may be brought into touch with creative enterprise on the land, and with a view to the park itself providing as far as possible for the food requirements of the visitors. There is no reason why all this—roads, buildings, land improvement—should detract in the least from the beauty of a large national park—competent planning and competent de-

BRIEF DESCRIPTION OF MY PARK

signing relative to all buildings would alone be essential. Motors and motorists should be segregated to certain definite track-roads within the park (such roads being strictly limited). Tracks would also be provided for pedal cyclists and hikers, and on these motors and motor cycles would be prohibited. A network of grassy bridle paths restricted to riders and hikers would be established and arranged in such a way that each led to a spot of particular beauty or interest.

Such a national park should be an area of at least 50,000 acres, and might even be 200,000 acres or more. My national park then would amount in essence to a very large 'Trade Guild Estate'. It is, of course, obvious that a single national park would not go very far in catering for the needs of the nation. The first essential is, however, to establish a park on comprehensive lines as a guide to further developments. In the main, the type of land that awaits development and offers the necessary facilities for the formation of great national parks is that scheduled as rough and hill grazings. I have always had in mind a block of country that I know intimately and to which I am greatly attached, and which has the merit of being within comparatively easy reach of Birmingham and many of the large Midland industrial centres. In the first edition of this book (published in 1935) I gave full particulars of the area in question, and explained in detail—with the support of two large maps—the arrangements I would have proposed to make in order to put my ideas into practice. I need now only briefly refer to my hypothetical park of those earlier years. In my imagination I had commandeered that considerable tract of wild hilly country including Plynlimmon, bounded roughly by the road Carno—Machynnleth—Talybont—Elerch—Goginan—Ponterwyd—Llangurig—Llanidloes—Carno, amounting in all to about 150,000 acres. To the west and north-west a fair proportion of this park (mostly in valleys) stands below the 700' contour, but the great majority of the park is on land between the 700' and 1500' contours, with a large central core running N.E.—S.W. (including Plynlimmon) exceeding the 1500' contour.

The scenery is varied in the extreme, and exhibits the full range of moorland and heath types of vegetation—from the fantastic peat hags east of Plynlimmon, through heather moor

MY NATIONAL PARK

bilberry moor, molinia moor to nardus and fescue pastures, with hillsides clothed in the little autumn-flowering gorse and the ever-increasing bracken fern. Apart from the beauty of the scenery of my park, with the stripling Severn, Wye and Rheidol and numerous other rivers and streams, a great merit is its accessibility by main roads from north, west and south, and, perhaps an even greater merit, the internal network of track-roads and tracks—these latter, to a large extent, the legacy of the old lead-mining days. Thus, I estimated that within my park and excluding main roads, there were 82 miles of road and track-road suitable for cars (at slow speeds) per 100 square miles, while in a comparable area in the Cheviot Hills there were only 30 miles of slow-speed motor 'road' per 100 square miles.

I am emphatic that in the case of a large park—and I see little point in small ones—the first essential is an adequate network of roads and tracks. This is as necessary for visitors as it is with a view to increasing the agricultural potential of the park, and my major thesis is that it is imperative to improve the agricultural productiveness and amenities of our hill land. My first aim was, therefore, to provide motor-track roads across the park in different directions and to appropriate centres. By a motor track-road I mean one that will be safe for cars at a maximum speed of about 25-30 miles an hour, and in which passing places will be provided at appropriate spots. Because of the refuse from the old lead-mines, the making-up of sufficiently good track-roads should not be difficult, and I had estimated, that apart from improving existing surfaces, my park could have been sufficiently opened up to motors by the linking-up of existing track-roads involving no more than about ten miles of new track. As well as providing track-roads sufficiently motor-worthy at slow speeds, I would have arranged for a large mileage of well-planned bridle-paths for riding. These latter can be easily made by drawing a dragging implement behind a crawler-tractor, phosphating and sowing grass and clover seeds. Such rides would necessarily avoid bogs, crags and rocky out-crops. I should support all my track-roads and bridle-paths by well-conceived signposting. My signposts would not have been blatant, but well-designed

AGRICULTURAL IMPROVEMENTS

and artistic—and why, indeed, should a sign and a signpost not be artistic.

My next endeavour would have been to well stock the rivers and the small lakes, of which there are an abundance, with trout, and all the lakes would have bridle-paths leading to them and be provided with boats.

Now I come to the really important and truly exciting problems, namely, how to blend the life of the normal inhabitants of the area—or, in other words, the interests of farming and afforestation—with the life and interests of the urban visitors. What to build and where to build it: what land to improve and how to improve it; what land to afforest and what trees to plant. But first I would beg the reader fully to realize that all the developments call for road-tracks and accessibility by motor-car and motor-lorry—the use of the internal combustion engine to truly creative, nay, spiritual ends; for who can deny that the enjoyment of natural beauty and of creative work well done calls forth something deeper than merely mental reactions.

The first essential seemed to me to select carefully the best areas for large-scale improvement in the grazings and to choose appropriate sitings for new buildings, while with this afforestation had to be considered. The major aim of tree-planting was to be to provide shelter-belts and to use trees in connection with the proper setting for all buildings: afforestation for timber production was to be relegated to steep hill-sides, and in no circumstances to be permitted to encroach upon the wintering grounds for stock. Moreover, trees were to be used, as far as the wit of man could design, to enhance beauty and not to detract from it. One of the most characteristic and arresting features of Central and West Wales is the shapely outline of the hills against the sky, so that it is a criminal offence for any scheme of afforestation to break the sky-line. The idea was to give full consideration to all these matters and to use trees like laburnum, maple, gean and mountain-ash effectively in connection with building sites and elsewhere as seemed appropriate.

Several thousand acres of grazings within the park are capable of radical improvement, while large areas of enclosed farm land run up the valleys. I would now propose to set up at least three, and, perhaps, as many as six central and large farms.

MY NATIONAL PARK

These farms would be so placed as to command at least 200 acres of land that could be brought into rotation, and not less than 500 acres of easily-improvable rough grazings. Each of these central farms would operate as a parent holding and would work in association with a comparatively large number of small filial farms. Each parent farm would be generously provided with crawler-tractors and appropriate implements, and would undertake all the necessary reclamations and subsequent cultivations for the filial farms, while it might be possible to set up grass-driers at the parent farms and for these farms to grow larger quantities of hay, roots and other winter feed than would normally be consumed on the spot, and thus to ensure a reserve available for the smaller of the filial farms.

Much of the work at harvest-time and in the root fields on the parent farms would be done by the holders of the associated farms, as one means of paying for cultivations conducted on their own holdings. The large parent farms would also afford opportunities for the urban campers to undertake holiday work in the root fields and at harvest-time. A proper organization of parent-cum-filial farms should make it possible to initiate a sound livestock policy for the whole park, aiming at breeding and rearing large numbers of cattle as well as maintaining maximum and healthy sheep flocks: every effort would also be made to introduce poultry and pigs on a considerable scale. The park should be self-supporting in livestock products (milk, meat, eggs and poultry) and this throughout the holiday season. The scope for initiating the improvements and organization I have briefly outlined is far greater now than it was when I first outlined my plan in 1935. The implications of the pioneering efforts of Captain Bennett Evans on the foothills of Plynlimmon and the far-flung achievements of the Montgomeryshire War Agricultural Executive Committee (at elevations between the 1000' and 1400' contours) brook no denial, and cry aloud for further and daring adventuring.

My plans for catering for the urban visitors were no less comprehensive than those for the rehabilitation of the agricultural community, and they were complementary. In substance, my suggestion of 1935 stands. I then advocated setting up a comparatively large central village at Ffridd Fawr, about two miles

CENTRAL VILLAGE

to the north-west of Staylittle. I also selected sites for five hamlets, and some thirty independent sites for small hostels and camping grounds.

At Ffridd Fawr I would have set up two or more hostels, a village shop and a well-equipped canteen. All could be most attractively laid out at the site, while a large number of separate huts could be erected, the whole arranged terrace-wise, overlooking the fine cliffs and valley running up from Llanbrynmair. That my site was well chosen and that the idea had an appeal is, I think, shown by the fact that Mr. Eden, of the School of Architecture at Liverpool University, set some of his students to plan and design my hypothetical village. My intention was to arrange for a camping site at the main village and at each smaller 'hamlet' as well as at the thirty other centres, and at each of these would be a series of well-designed sleeping-huts and a central meeting room.

It would probably also be possible to arrange for camping and other facilities at each of the parent farms and at some of the filial farms. As I have said, one idea behind my scheme was to provide ample facilities for riding, so that provision would have to be made at each centre for the baiting of ponies, and a sufficient number of ponies would have to be kept at the central village and at the parent farms, while, incidentally, the breeding and breaking-in of ponies would become an important feature of the agricultural activities of the park.

It seemed to me desirable to maintain a permanent boarding-school at the park, and I advocated the building of a large and well-arranged school at Ffridd Fawr. Here young people aged 14-18 could be brought from the cities for varying and appropriate periods of time, both in the holidays and in term. The school would, of course, have its own staff, men and women who would have been selected largely for their knowledge of agricultural and country activities and of natural history. The school would be a centre for meetings and lectures throughout the holiday season.

A park such as I have envisaged would afford unique facilities and great opportunities for bringing the urban population into close and organic connection with the country. It would be essential for a comprehensive book to be produced giving de-

MY NATIONAL PARK

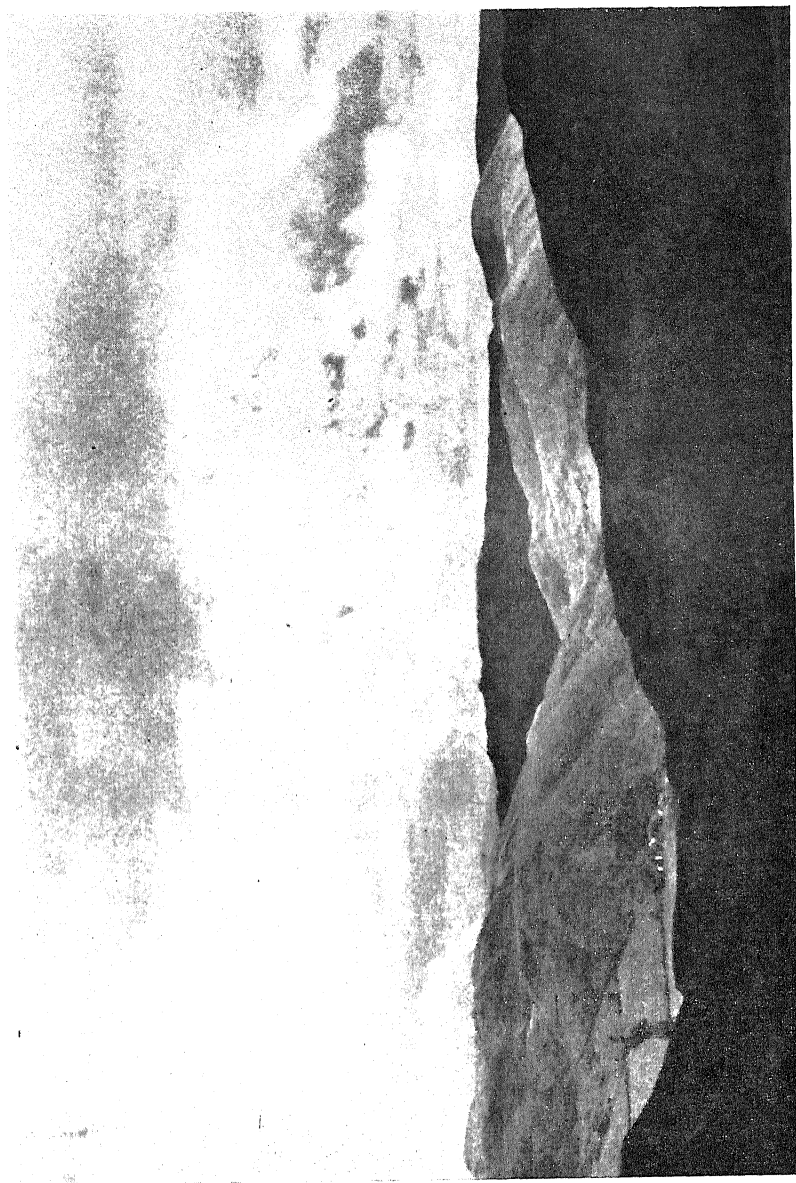
tailed particulars of the geology and natural history of the region; describing the agricultural practices, past and present, and the main archaeological and historical features.

My Park has been very closely studied from many different points of view by a number of my old friends and colleagues at the University College of Wales, Aberystwyth, and it should be possible to produce a model 'guide' (so much more than a guide!) to this area so uniquely suited to the fulfilment of my dreams.

I have briefly described my dreams of 1935. I could dream better dreams now, in 1944—dreams that are, no doubt, shared by increasing numbers of both idle and active dreamers, but I must admit I am rather terrified by 'advances' made in the meantime. I fear that Whitehall and Westminster are not favourable atmospheres for creative and all-embracing dreaming, and I fully expect that one of these days we shall see set up a central authority to take care of national parks, as such, and then what about the proper co-ordination of agricultural development and reasoned afforestation—having regard equally to shelter-belts, amenity and aesthetic values, as to timber production *qua* timber production—with the best interests of the rural inhabitants and the urban visitors alike. National parks, to be of full value, cannot be considered or administered just as holiday resorts for urban workers and for wild life, they should be both of these and also so much more. No, Westminster and Whitehall react rather to nightmares, induced by strong pressure from one-sided and short-sighted partisans of particular and *ad hoc* causes, than from dreams engendered by the deep and placid contemplation of the needs of the peoples of the country as a whole or of the best use to which to put particular parcels of land as a whole. That is the danger, and one fears may well be the tragedy, arising from modern trends and aspirations.

I think I can most usefully conclude this chapter with the same paragraphs with which I also concluded my 1935 chapter. Idealistic, yes, but no less to the point, I think, now than then.

An Island nation, and one whose greatness has been to a marked degree born of the sea, should not, however, think only in terms of the land when considering any problem whatsoever, and especially when considering the health and recreation of its



Sunshine and Shadow: my National Park

OUR COASTS

citizens. We as a nation are neglecting the sea, and perhaps to our peril and to our ultimate and irreparable undoing.

Boating, sailing, sea-fishing, like the sports and pleasures of the country, will have to be made available to the urban workers, and this before it is too late to do so. All around our coasts are small harbours once the scene of considerable activity, and now for the most part lifeless and listless, with a rapidly dwindling seafaring population. Sailing and boating remain the prerogative of the few. Save for trips on pleasure steamers or cruising motor boats from the larger seaside resorts, the great majority of the town workers are content merely to look at the sea. National parks could usefully be made also to embrace the sea, and what a wonderful thing it would be if a number of our neglected little ports could be given new life as centres at which to organize boating and sailing on a large scale. The aim should be to provide ample facilities for teaching boat-craft and for the encouragement of young people manning their own boats. The country is not large enough wholly to eliminate the herding together of people on holiday—resort must also be made to the sea and to our estuaries. The dangers of the sea and of boating are as nothing compared with the dangers of over-congested roads in the holiday season.

By no means all of the coves and bays around our coasts have yet been ruined by the springing up of seaside resorts and bungalow towns; there is still time to establish well-conceived national parks, providing cheap week-end shacks (cunningly designed) and cheap boating facilities, not for the few, but for the many—the masses.

In the matter of healthy enjoyment and the best use of leisure, the demand must ever follow in the wake of facilities, just as in science great developments and discoveries follow on improved technique. Far-reaching benefits in terms of the happiness and stability of a people can only be brought about by experiments purposefully and boldly conducted. The nation at large needs so much more than its Brightons and Blackpools; more, even, than its Lowestofts, and something very different from the select, or more or less select, bungalow villages and hamlets on the Cornish coast. National parks on the coast, rendered as easy of access as the great resorts, and providing simple week-end

MY NATIONAL PARK

accommodation and abundant facilities for boating and fishing—that must be the next development, and one which can only follow on experiments conducted on entirely new lines and animated by very different aims from those which have so far been responsible for the use to which our harbours and coves have been put. There are still suitable sites for the establishment of such parks around and near the little ports of Cardiganshire, south of Aberystwyth, Almost the whole coast of Pembrokeshire is unspoilt, unbuilt over and not yet developed (!) while there are still places on the coasts of Devon and Cornwall that could be allocated almost *de novo* to this purpose. The nucleus of the seafaring population still exists ready to expand, to teach and to adjust itself to the new demands and to the new age. The sea, our coasts and estuaries, with their ever-changing aspects, abundant bird life and interesting flora, afford almost unlimited scope for individualistic enjoyment, while in a boat and on the sea it is always possible to escape from the multitude, and, as the author of 'For Ever England' has told us, to acquire experiences and the sort of self-reliance that so well become an Englishman.

In conclusion, it is worth while again emphasizing that the establishment of national parks should aim at providing individualistic and out-of-door (as opposed to herded, largely indoor and wholly man-made and artificial) recreation for the wage-earning and lower-salaried urban workers. To provide opportunities for such recreation is, perhaps, the greatest of all problems that face this rapidly-changing age—to do so is the natural corollary to slum-clearance, and the natural corollary to shortened working hours and improved industrial conditions. Leisure, properly organized, would provide a great deal of regular employment—out-of-door employment at that. In the first instance there would be the preparation—road and track making, building of hostels and of shacks and the like; then there would be the building of boats. In the second instance, there would be the necessity of maintaining the parks, providing instruction (for example, in riding, swimming, boating) and ensuring safety. It would be necessary, if boating and sea-fishing are to be made a truly national recreation, to establish a well-organized patrol service (adequately manned and swift motor boats) around the coasts and in the estuaries.

IMPORTANCE OF PARKS

With no little conviction, and in great sincerity, I commend my thesis of the national park to the nation at large. It must be remembered that the present low coefficient of ruralicity of the people of this country has been the product of hardly more than one hundred years. Furthermore, there was no purposeful planning designed to create a completely urbanized national spirit in the shortest possible time. It would seem to me, therefore, unless our coefficient of purposefulness has dwindled to almost nothing, that we should be able to rectify the consequences of one hundred years of drift by no more than fifty years of strenuous and well-conceived endeavour.

CHAPTER XXIV

The Need for an All-embracing Survey and Enquiry

All aspects of land utilization must be covered. Previous agricultural surveys; ecological, soil and economic. The Land Utilization Survey of Britain. The six-inch map of the Ordnance Survey. Aerial surveys. A modern Domesday Book; co-operation between experts. Scheduling of houses, farms, and the land. Government responsibility.

THE need is indeed great; I hope I have already made it obvious how great. I must, however, dwell at a little length on the means of gathering together the necessary information and on the items of the greatest importance.

The first essential point I would wish to make is that no survey and enquiry can be regarded as complete unless it covers the whole country, and unless all the facts are scheduled, and unless every single piece of evidence which it is possible to show on a map is committed to a map. The preparation of an all-embracing series of detailed land utilization maps should be regarded as the basis of the survey. The second essential point is that the enquiry must cover every aspect of land utilization and concern itself with all the uses to which land is put and can be put. The enquiry must, therefore, also concern itself with all the factors, circumstances, conditions and developments which influence the calls which are likely to be made on the land.

A considerable body of information exists already; but it is scattered, unstandardized and diffuse, and has been collected by all manner of different persons for all manner of different purposes. Much of the evidence collected has been published but a great deal has not. The need of enquiry has been present in the minds of men ever since the first and only edition of Domesday Book became out of date. We have had general impressions and

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heart-felt expressions of opinion from that most sturdy of countrymen William Cobbett. We have had the more detailed reports which were prepared at the instigation of the State when a Department of Agriculture was first set up, while in the present century we have had accounts of considerable tours made by agricultural scientists, notably Sir Daniel Hall's *Pilgrimage of British Farming* and Professor J. A. Scott Watson's *Rural Britain: To-day and To-morrow*.

The detailed surveys of quite recent times have been of three main types. The soil surveys conducted by agricultural chemists (these to a considerable extent have been committed to maps), the results of such surveys having been correlated in varying degrees and from a variety of points of view with vegetation and agricultural practices. The primary vegetational surveys of the ecologist have been committed to maps, but not all have been published. These latter surveys are of particular value in relation to rough and hill grazings, for it has been upon such country that most of them have been undertaken. They have, however, been conducted on a variety of different plans, some by professional botanists, and some by professional agricultural botanists: the correlation of the data with agricultural and soil conditions has therefore been only partial, and has been influenced by a number of different points of view. The most recent type of survey has been that conducted by the agricultural economist. These surveys are now usually supported by very detailed scheduling, and the tendency has been to work on the basis of increasingly large samples. The evolution of this exceedingly valuable type of survey can be followed, for example, by reading first, such a book as Orr's *Agriculture in Oxfordshire*, and then *The Progress of English Farming* series issued by the Institute of Agricultural Economics at Oxford, and finally, the *Economic Surveys of Agriculture in the Eastern Counties of England* issued by the Economics Branch of the Cambridge Department of Agriculture.

All of the above types of survey deal directly or incidentally (the primary surveys of the ecologists) with agriculture, but they are all incomplete, and not one of them has been sufficiently concerned with the state of the land itself and of the farms as such in relation to any ordered programme of re-conditioning.

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There is no single area in the whole country that has been concurrently mapped and scheduled (in detail) from all the points of view that have severally animated those who have conducted the individual surveys.

In regard to the non-agricultural uses to which land is put, although local and limited surveys have been made by individual enquirers, no large-scale and comprehensive survey on a regional basis has yet been carried out. The survey—the Land Utilization Survey of Britain—now being conducted under the directorship of Dr. L. Dudley Stamp, however, constitutes a gallant attempt, with limited resources, at a general survey (both agricultural and non-agricultural) and the maps already published are in themselves of considerable interest, and are of the highest possible value as showing what could be done—and comparatively quickly—with a sufficiently large and properly trained staff of surveyors. The Land Utilization Survey also emphasizes the fund of information that is contained on the 6-inch maps of the Ordnance Survey.

The 6-inch map must be the foundation—and a very solid foundation—upon which to base a complete survey of the country. The 1-inch maps of the Land Utilization Survey (which have been based on the 6-inch maps) bring out in a striking manner the difference between the relative space occupied by the core of the large towns without gardens and by the environs with gardens, and also show with comparative accuracy (for gardens, allotments, orchards and nurseries are associated with the habitations of man) both the distribution and size of the residential areas, villages and hamlets in relation to rough grazings and cultivated land. To be able to see all this at a glance is of great value. The areas respectively under cultivated land, permanent grass and arable are differentiated, and those in common and rough grazings are also delineated, and probably with a very fair degree of accuracy. The maps would have been altogether more informative if commercial orchards and nurseries could have been shown separately from private gardens and allotments, and if market gardens had not been included with ordinary arable land, also if the rough grazings could have been broadly characterized. This, of course, could not have been done without the aid of a trained staff.

PREVIOUS AGRICULTURAL SURVEYS

With a trained staff of qualified botanists and agriculturists—and it would not mean a large staff—it would be a very easy matter at the next revise of the 6-inch Ordnance Survey maps to differentiate between the several main classes of agricultural, horticultural and private land, and between the several types of rough grazings. The point is that to a very large extent the areas as such are already mapped; it is chiefly the categorization that is lacking.

A complete survey and enquiry could, of course, only be undertaken under government auspices, because nothing less than a modern Domesday Book supported by maps will meet the case. The surveyors and inquisitors would have to be given authority in order to obtain some of the information required. The information required is of two types, that which is automatically revealed on the ground to a discerning eye, and that which can only be obtained by enquiry.

Both enquiry and survey could only be conducted by a team of technicians all working in constant collaboration with each other: architects and engineers; sanitary, electrical, transport and military experts; botanists, chemists, economists, agriculturists and foresters, for example. To map the present with a view to the future would of course be the underlying aim.

In so far as the actual mapping is concerned, the material assistance that can be afforded by an aerial survey needs to be stressed. Aerial photographs show the sinuous boundaries of salient types of vegetation with a degree of accuracy that it would be impossible to achieve by any other means. More than this, with a little practice a vegetational surveyor would be able to read a great deal into an aerial photograph. A system of collaboration between a man on the ground and a man in the air would afford an ideal and rapid means of conducting a survey of the vast acreage of rough and hill country. An aerial photograph reveals at a glance, and even to the almost complete novice, the difference between broadwood and coniferous trees, scrub and bracken, and delineates the outlines with striking clarity. Aerial photographs also show to perfection all types of tracks, even such as are practically never used, and, of course, give a supremely accurate picture of the relation of habitations of all kinds to the surrounding country. An aerial survey of the country would, for

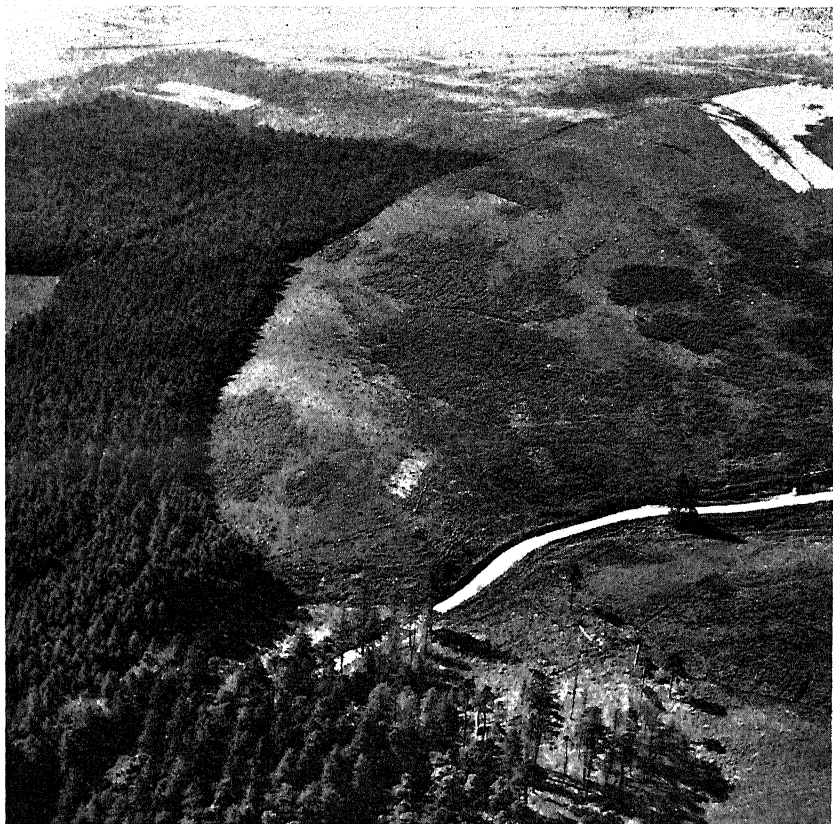
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example, afford final and damning evidence as to the unco-ordinated and haphazard manner in which new housing units, and not only the ribbon-wise units, have been scattered over the country and would, I imagine, be of supreme value to those who desire to plan and co-ordinate housing schemes and road development. Here then awaits a very important peace-time and constructive activity for the R.A.F.

I should regard the question of ownership as of the first importance. Apart from periodic returns obtained by the Ministry of Agriculture relative to the owner-occupation of farms, there is no evidence available since that which was given to the House of Commons in 1876. At that time apparently one-quarter of the land of England and Wales was held by less than one thousand individual owners, while owners of less than fifty acres formed more than 90 per cent. of all landowners. What is the position to-day? Where are the large estates, and how does the size of owned-units accord and fluctuate with geographical position, conditions of soil and climate, with standards of farming and with the condition of houses, buildings and cottages? None of these things can be properly gauged and assessed until the facts are available, and until ownership units (estates big and small) are shown on a map.¹ The Inland Revenue people must know a great deal about all this, and they must also know all about the proportion of incomes per owner derived from such ownership and derived from other sources—information of immense importance from the regional and local point of view, but of proportionately less value when applied to the country as a whole.

Second to ownership in importance I should place the character and condition of farm-houses, farm buildings and of cottages as units, and also of villages and hamlets considered as units. A committee consisting of architects, land agents, farmers and agricultural scientists would have no difficulty in drawing up a simple schedule consisting of roughly half a dozen classes for the categorization of houses, cottages, buildings, villages and hamlets. The schedule having been drawn up, the facts could be committed to a map, and until all these matters can be looked

¹Boundaries are often in dispute and are frequently more or less arbitrary. The map should, however, be prepared with as much accuracy as possible—doubtful boundaries could be marked as such.



Aerial photograph: Cahn Hill Improvement Scheme
Coniferous trees, clumps of bracken, and patches of newly ploughed hill:
1,000-1,200 ft. above sea level
Royal Air Force official—Crown copyright reserved

at and compared regionally and locally no man can say what is the right and proper policy to be adopted towards the defects, abuses and anomalies that would be revealed. The schedule as to farms, cottages and buildings would necessarily include a 'condemned' class—condemned because completely dilapidated or situated in an impossible place. The various types of ribbon development—those with sanitation; without sanitation; with verges between road and houses; without verges between road and houses—could also be scheduled and therefore mapped.

I wonder if the various road authorities are possessed of excellent maps showing the precise nature and condition of the roads under their care, and I wonder if the road authorities (at the Ministry of Transport) are always planning and considering new track-roads that might be required for the service of the country as a whole. I think, however, in any event roads should be regarded as a very important feature of the all-embracing survey, and I would particularly commend to the surveyors the needs of isolated districts and hill land.

The engineers would be concerned primarily with the provision and removal of water. A considerable amount of information has been collected by the Catchment Boards, but there remains a great deal of accurate mapping to be done. The military authorities would be concerned with new sites for camps and aerodromes. The sites for prospective developments should be marked for example, as 'suitable for an aerodrome'; 'suitable for a catchment area'; 'suitable for national park' and so on; 'suitable' meaning that all other possible claims had also been considered.

As to the land itself, from an agricultural point of view I need add very little. I should attach great weight to the condition of fences and drains, both of which after the proper schedules of classification had been drawn up could be accurately mapped. Each field should be categorized accurately, and as such, the actual crop or bare fallow stated, and the grassland scheduled. In my chapter on vegetation I referred briefly to this question of classes of grassland and of grazings. The classes would be somewhat amplified—to a maximum of twelve classes including bracken and heather. When the high proportion of the whole country under grazings of one kind or another is realized—and

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if the reader has not realized that, my book has indeed been written in vain—it will be apparent that a proper categorization of these grasslands shown on a map would be an absolute essential in any survey concerned with the condition of the land which set out to be all-embracing.

With reference to rough and hill grazings the grasslander, the agriculturist, the forester (the Forestry Commission must have a great deal of survey information pigeon-holed in their archives) the water engineer, and an expert charged with the future development of national parks would have to work in the closest harmony, for here the choosing of prospective sites for each and all of the various needs would be of the first importance.

I have said enough to indicate what is implied by an all-embracing survey. In view of the sporadic and spasmodic surveys that have already been conducted, in the aggregate at no inconsiderable cost, and with but little real advantage as affecting land utilization, I think to organize anything less than an all-embracing survey *cum* enquiry would be a waste of time, money and energy.

An all-embracing survey, as I have said, could only be undertaken under government auspices, and would demand the setting up of an *ad hoc* department—and an essentially technical department at that. The first necessity—for the whole question is highly technical, complicated and bristling with difficulties—would be for the Government to set up a commission, or a committee of enquiry which was strongly weighted with technical members. The term of reference being one calling for action, not such as would lead to nothing or to a waste of time in trying to decide an issue beyond dispute—whether such a survey was necessary or practicable. The explicit duty of the commission should be to report and advise as to the organization that would be demanded in order to produce the long overdue second edition of Domesday Book in sympathy with modern requirements, and then to keep that great work up to date.

CHAPTER XXV

Education and Research

Rigid standardization and the examination system. The urbanization of education. Examinations a vested interest. Subjects and exercises in thinking. Learning and research an adventure. Wisdom, contact with the country. Intellectual and professional snobs. Shorter class hours. The organization of research; team work and collaboration. Problems versus sciences. Grassland research. Agricultural research and farm practice. The bane of the canons of good husbandry.

A single chapter on education and research may appear actually out of place, or in any event wholly inadequate, in relation to the matters dealt with in this book, for the subject is fundamental, and would seem to call for exhaustive treatment if it is to be touched upon at all. I hold certain definite, and I think decidedly unorthodox, views relative to both education and research, but I think they have a real bearing on the problems I have been discussing, and on the various suggestions I have put forward. Consequently I shall endeavour to formulate these views, and possibly, though only put forward in very general terms, they will serve to illuminate and strengthen the underlying thesis that I have endeavoured to elaborate."

In order to consider education and research from the particular—the agricultural and rural—point of view it is first necessary to touch upon the question in its general bearings.

If our system of education is wrong and based upon faulty principles then, of course, everything must be wrong. The trials and errors of mankind in the last resort are almost of necessity primarily due either to faulty education or to congenital ineptitude. If we consider the enormous advances that have been made in the power man has achieved over nature, which betoken very considerable aptitude, we can hardly assign man's inability to

organize his own affairs and happiness to congenital ineptitude. In any event to do so would be to despair of ever achieving to a reasonable measure of worldly grace. The more courageous and more helpful attitude of mind would be to attribute all our errors and troubles to faulty methods of education.

The symptom, and most probably the actual cause, of our faulty education in my view may be summed up in the one word standardization and all that standardization stands for and leads to.

The tendency to-day is towards standardization in all directions, and therefore, of course, education and research have not remained exempt. It is assumed that we know what should be taught and that we know the best way to teach. The result is a standardized system of examinations, and teachers themselves are taught how to teach. Everything tends to be more and more rigidly standardized, which implies the tacit assumption that the system to which we adhere is perfect. Thus we proceed, tightening our self-made shackles with every step we take.

The aim of education should surely be to make the most of the inherent and vastly different aptitudes possessed by every single individual, and therefore teaching should be as little standardized as possible, so that the pupils might encounter as many methods and points of view as they do teachers. As long as the whole system of education is examination-bound, there is the minimum of scope for the individuality of either the teacher or the student to expand and develop. Modern education has grown up along with our urbanization and industrialization, and has completely lost touch with the country and with the sturdy individualism born of contact with the country. The schoolroom and the lecture theatre are as tied to a process—the process of acquiring a standardized school certificate, a standardized matriculation, or a standardized degree—as is the factory or the counting house.

Rigid curricula enforced by a narrow and rigid examination system in my view are the two factors chiefly responsible for the mass ineptitude of the leading races of mankind to-day. So-called educated man never escapes completely from the influences of his so-called education, and he will always judge of attainment by what is tantamount to examination standards.

RIGID STANDARDIZATION AND EXAMINATIONS

A huge vested interest has grown up around the examination system,¹ while it is so much easier to teach a pupil or a student with a view to cramming him through an examination than to set out to educate him—to make him a complete master of his own aptitudes. Every man who has done anything in this world, and who has made a success of his life, knows perfectly well that his success has owed little or nothing to the necessarily small body of facts that were pumped into him at school, or even at a university. Deep within himself he realizes that he owes everything to the fact that somehow or other he was taught, or he found out for himself, how to acquire knowledge for himself, and how to use it to the best advantage. I believe it matters very little indeed what particular subjects people are taught—all subjects alike serve as exercises in thinking. The person who has been taught to think and to take an interest in thinking, and in knowledge, will have been taught also to acquire knowledge in the directions most useful or interesting to himself for himself, and such a person will be a learner and a seeker after knowledge all his life. Thus to equip a person can surely be the only aim of education.

I can see no hope of introducing a broader and more varied scheme of education until the examination system is abandoned completely. I have frequently expressed this view to colleagues, and am always laughed to scorn. They say it would be impossible to keep tally of students and to select men for posts without the aid of examinations. Many deplore the effects of the system, but refuse to search for the snake in the grass, or if they hear the rustling of the leaves seek rather for a charm than for a bludgeon. In all seriousness I would prefer a system of patronage and nomination the whole way from entering school to taking an honours degree to the present deadening and mentally degrading standardized examination system, and this notwithstanding the possibilities of corruption and favouritism. We should then begin to see every school showing a marked individuality, while there would be some hope of the true spirit of learning and fellowship more strongly animating the activities of the universities. It is far more important that ten university students

¹The correcting of examination papers is not a creative enterprise and therefore is not a healthy means of acquiring a subsidiary income.

should be taught how to think to the utmost of their inherent capacity than that a hundred or a thousand should be armed with a certain amount of well pigeon-holed information

Education and research are really the same thing; they are a part of life, and therefore should only be approached in the spirit of a gigantic adventure, and consequently all teaching must be conducted in an adventurous manner. The pupil must be made into a research worker from the outset rather than into a blind believer and docile learner.

Our method of education has undoubtedly accentuated the drift from country to town, because it has tended to equip the more intelligent, even of country children, rather for the life of the towns than for that of the country. Worse than accentuating the drift towards the towns, however, has been the fact that the whole trend of education has been to glorify book learning and proficiency in the various subjects—subjects! there are no subjects. It is only the true countryman who appreciates the fact that life is life and learning is learning and that all divisions into subjects are artificial and man-made, and it is this pigeon-holing up of a boy's mind at school which in direct proportion to his intelligence—his capacity for being corrupted—renders him unsuited for life in the country which demands, above all things, an almost sublime naturalness devoid of all artificial mental restrictions and barriers. Wisdom is the capacity for seeing life whole, and for bringing to bear on the problems of life all the knowledge of which a man is possessed. To force knowledge into a person beyond his capacity of converting facts into wisdom, or until we know how to manufacture wisdom in the classroom or lecture theatre, is an act of pure folly, and in fact probably decreases the sum of wisdom at the disposal of mankind. Yet we have the astounding presumption to standardize our methods of education, and this before our universities, our education authorities or our teachers have begun to make a serious study of wisdom and how to create wisdom.

I have more than a strong suspicion that wisdom is associated with simplicity and naturalness and, therefore, that wisdom can be heightened by a closer contact with the country and the doings of the country, and perhaps by taking greater heed of the lessons of the country and of nature. It is certain that wisdom

and priggishness are not compatible, and there is very seldom much of the prig about an essentially wise man. Certain too is it that our modern system of education tends to manufacture not only prigs but also and alas! it tends to manufacture intellectual and professional snobs—snobbishness is no more compatible with true wisdom than is priggishness. I do not think I have ever met a real farmer who is a prig, and I have certainly never met one who had about him anything of the professional snob. Prigs in plenty there are behind the counter: you will meet them as chauffeurs, and in almost all walks of life, but they do not exist amongst agricultural labourers, whilst aristocrats, and not snobs, are to be found in every parish trudging behind the plough.

Solitude, silence and contemplation, for these the country still provides and these are the woof and warp of wisdom. Yet modern education will have nothing to do with them. The child, the secondary or public school boy, and the undergraduate are alike hurried from class-room to class-room and rushed from one form of competitive exercise to another. The curriculum and the examination system drive them unthinking, unfeeling and unseeing headlong to their doom. Some fall by the way, unable to resist the desire to think and to contemplate; these fail in their examinations and many of them, because warped by the system, fail also in life: a few win through, and despite all the handicaps attain to great learning and great wisdom—but, oh! how few!

Such is my diagnosis: and what of the remedy? Firstly, I should say fewer subjects and those more inspiringly taught, and with this a greatly shortened working day and time definitely allocated for doing precisely nothing. Secondly, actual lessons in the noble art of contemplation; and thirdly, greater contact with the country. I do not mean set lessons in nature study, but excursions into the country with a master who understands the doings of the country and who loves the country. Every school of every grade should have at least one such master, who would take the pupils in batches of not more than six at a time into the country once a week. In like manner at the universities there should be a number of fellows—countrymen at heart, men replete with country lore, philosophical in outlook and of deep wisdom—

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always taking small parties of undergraduates indiscriminately chosen from all the schools of study into the country. It is only by such methods as this that we can hope to cut across our mass methods of education and side-track the baneful tendencies towards a stereotyped mass psychology.

The tendency towards priggishness and even snobbishness to which I have referred carries right into our methods and organization of research, and with effects that are not far to seek. I think that all this is accentuated by super-specialization in terms of subjects. It cannot be denied that modern research has gained much from this exaggerated categorization and from the practice of creating new subjects and new sciences, but it has lost much in so doing, and is perhaps now in actual danger of losing everything.

In so far as agricultural research is concerned, I am convinced that a serious mistake has been made in the endeavour to organize such research in terms of subjects—chemistry, physiology, genetics, economics—rather than in terms of the basal problems of agriculture itself. The problem is everything and is real, the subject, as I have said, is nothing but the product of a man-made classification. A particular problem may be claimed as the prerogative of either the chemist, the botanist, or even the veterinarian, and in the scramble for such a problem there is much scope for an unedifying display of professional snobbishness. In cold fact there are very few problems in agriculture the solution of which lies in the power of any one narrow specialist. Even with the best will in the world it is very difficult for specialists working at different institutions to collaborate in the solution of a difficult problem. The one certain method of ensuring intimate collaboration between specialists is to collect together a band of men, each expert in a different branch of science, all under one roof and under one chief, and to set them to work at one great problem, or one group of problems. To my mind this is the only rational basis for the foundation and organization of a research institution—on the basis of problems and not of subjects.

The tendency to-day is still to staff and administer even applied research on the basis of the sciences and subjects rather than on the basis of problems. A tendency which demonstrably exaggerates narrow specialization and encourages a search for lesser

problems at which to work—problems of a type which the specialist in his arrogance may hope to solve by recourse only to the resources of his own science—rather than endeavours to unravel the problems which from the practical and applied point of view cry most loudly for solution. In the hearts of those who administer research and control the purse strings there is much fear of over-lapping. If teams of workers were arranged on the problem basis there would be a vast deal of over-lapping of subjects but very little over-lapping in relation to the all-essential solution of problems—and, over-lapping or no, the problems would be solved, and that is the sole aim of applied research. There is no doubt that there is virtue in over-lapping: it is bad for a man, and for an institution, to feel in sole possession of a problem—every problem is the property of mankind—and I feel very strongly that those whose duty it is to administer research should move very warily in the matter of the over-emphasis of prerogatives of this sort.

I can best illustrate what I mean by reference to my own institution. The major aim of the Welsh Plant Breeding Station is to study the problems of grassland. From the outset we have endeavoured to study the whole problem of the sward, and it is, of course, impossible to advance very far without taking account of the grazing animal. To take proper account of the grazing animal, and the interaction of the sward and the animal, would, however, imply the study of animal nutrition and innumerable bio-chemical problems, while the problems of disease could not be ignored. The study of all these matters is essential relative to even plant breeding, which cannot be pushed forward to the best advantage if merely considered as a water-tight aspect of the grassland problem.

Under the scheme of agricultural research my institution is, however, deemed to be concerned only with the botanical aspects of the grassland problem, and therefore the institution is staffed wholly with botanists. To a large extent, therefore, our outlook is necessarily warped and our endeavours restricted. Fortunately, because of close association with Professor Fagan and his Department of Agricultural Chemistry, we have not been divorced from the point of view of the chemist, and the chemical aspects of many of our problems have been brought

under investigation. This has, however, been nothing but a fortunate accident. Professor Fagan is himself interested in grassland, but it might well have been that Professor Fagan's interests were in an entirely different field of endeavour. I have no veterinarian, no bio-chemist and no animal nutritionist on my staff—these subjects are not the official concern of the Welsh Plant Breeding Station, although grassland is our problem. These subjects are for the research stations concerned with animal nutrition, animal disease and animal health, each of which is isolated and handicapped in the same way that we are. A mixing of the sciences and a reasoned isolation of the problem is the way to progress—of that I am certain. I want to see botanists on the staffs of the animal nutrition stations; bio-chemists on the staffs of stations like my own, now wholly manned by botanists—for that, I repeat, is the only way to ensure active and purposeful co-operation between the sciences, and it is only by such co-operation that the basal and practical problems of agriculture can be tackled to the best advantage.

There remains another aspect of agricultural research, and that is the question of farm practice; for, unless the best use is made of the findings of science in the byre and on the field, of what avail the findings? It is in this connection, in my view, that we have the weakest link in the chain. To translate science in terms of farm practice demands out and out research and a vast deal of field experimentation. But little State-aided research is being undertaken in farm practice with a view to the discovery of entirely new methods of farming—new rotations and the like—this is left almost wholly to the practical man. When we think of research we immediately think in terms of subjects and what we please to call the subjects of science—agricultural chemistry, agricultural botany, agricultural economics, and we forget agriculture as such, which has not even yet been elevated to the rank of a research subject. This, to a large extent, has been due to the professional snobbishness which seems to be inseparable from narrow specialization, and it has undoubtedly also been due to an over-concentration on the problems of individual crops considered as independent units.

We hear much of the need for demonstration farms. In fact most of the farms of the farm institutes and of the agricultural

departments are demonstration farms—and good demonstration farms at that, frequently run at a profit. I question whether such farms are necessary—the best privately-farmed farm in every district is usually the best demonstration farm of all. The need is for experimental farms, research farms, mad farms! Farms where discoveries in the arts of farming are being made, where new rotations are being invented, where entirely new schemes of farming are being evolved, for that is what science necessarily implies, if the facts of science are to be brought fully to bear on the practices of farming. Until we have an agricultural research station as opposed to stations devoted to the sciences I see little hope of science contributing in full measure to the evolution of the new agriculture. The more progressive of the agricultural departments and of the farm institutes, might, however, do much in this direction if they could break away from the canons of good husbandry, and regard themselves less as demonstrators and more as experimenters, and if a creditable balance sheet was not deemed to be a prime necessity and the chief criterion of able management. To-day the canons of good husbandry built of the centuries are all but dead; agriculture, like everything else, is in a state of flux. There is very little to demonstrate and everything to find out. A spirit of adventure and an ability to change with the times is what agricultural education and research must endeavour to transmit to the rising generation of farmers.

To experiment implies movement, change, endeavour; to demonstrate implies satisfaction and self-complacency, and leads, and often extraordinarily quickly, to stagnation. On this note I think I can advantageously close my chapter, for in my view no system of education can be satisfactory and lead to gigantic results unless at all stages it is conducted in a spirit of adventure and of research, and unless it is based, first and foremost, on experimentation.

CHAPTER XXVI

Further and Final Proposals

My presumption. Planning for posterity; the need of experiments. Owner-occupation versus land nationalization. Powers of compulsory purchase and credit facilities. State subsidies to agriculture in kind. A Ministry of Lands; centralization and decentralization. District Commissioners. The land our heritage; the indelible impression of the land.

On reading over my script, before writing this final chapter I have been struck most of all by my presumption. The interesting fact is, however, that I am not in the least penitent, keenly as I realize that it is presumptuous for a man who has not studied public affairs, and who has a distinct antipathy towards everything that savours of politics, and who scarcely ever reads a political speech, to make serious suggestions and proposals which go to the very heart of national policy. Still more presumptuous is it to have done so because I have been averse to arguing the matter out with able people whom I meet who are both knowledgeable and interested in affairs, and I have been at insufficient pains to inform myself as to what other people are thinking and proposing. My conscience is, however, perfectly easy in the matter; partly because I am enthusiastic by nature and I am convinced that my presumption is in a good cause, and perhaps chiefly because I am satisfied that I have made up in long and serious thought and observation for what I must have missed in study and discussion. I lay myself open, however, to a two-fold criticism: my opinions and proposals may be all wrong, and my method of approach not only out-of-date but faulty. On the other hand, it is within the bounds of possibility that my opinions and proposals have about them a modicum of soundness which may owe not a little to the fact that, although much thrown amongst clever, and often opinionated, people of all

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shades of thought, I have yet contrived to achieve for myself a considerable measure of mental isolation. I must now draw together the threads of my argument and presently conclude with a final—and on the basis of all that I have brought forward an inevitable—proposal and one wholly in the realm of affairs.

I realize, of course, that to plan for posterity is to use a two-edged sword, for both the political and economic aspects of any question, as I never tire of reiterating, are only ephemeral, and such is the instability of human thought and action that any long-range policy in its development must necessarily be the plaything of an infinitude of variables, and as the years advance will come ever more closely to resemble 'a wounded snake' that 'drags its slow length along'.

Admit all this, and that any action which makes it possible to achieve what is deemed to be a desirable end must of necessity make it difficult, and in some cases actually impossible, to attain some other goal—and from the point of view of posterity perhaps an essential goal, and one that at present no man could have supposed to be either within reach of human endeavour or to the advantage of mankind. Even so it must be remembered that whether man, consciously and conscientiously, plans or not, he is never hibernating, and he will probably do more mischief to posterity by moving forward in a series of fitful 3-5 year political makeshifts based on the principle of endeavouring to solve the problems of the moment, or upon no principle at all, than if he had the courage and belief in himself to endeavour to formulate a broad programme for an epoch of no less than 100 years, and with the determination at all times and in all places to create the minimum of white elephants for posterity. He who believes in an ordered evolutionary process—and behold man's intellect, a considerable evolutionary achievement despite our human limitations—as opposed to the interaction and intervention of innumerable and mostly diabolical accidents, has no alternative but to regard it as the sacred (= evolutionary) duty of man to plan for posterity which is the care of evolution.

The basis of all planning should be experimental and therefore creative and evolutionary. It should be founded on broad principles and always with a view rather to the prevention of devastating errors—for that I believe to be within man's

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competency—than with the avowed aim of reaching a goal that has been too narrowly pre-defined. The greatest dangers to be guarded against are excessive rigidity and formality in the plans themselves and in the methods of procedure laid down for carrying them out. The goal needs to be approached in a spirit of research, and by a variety of routes. While unless experimental planning is designed to stimulate thought in all directions and to encourage originality in action, little or no use will be made of the talent of exceptional men, while the exceptional, and perhaps crucial, circumstance will be all too likely to pass unnoticed. Exceptions are golden, a gift of the gods and the foundation of progress: the evolutionary process itself deriving its motive force from an ordered and steady flow of exceptions.

I have formulated the principle that to allow the whole of Great Britain to become urbanized would be a criminal error, and that it is a criminal error to permit nearly 80 per cent. of the population of the country to be almost completely deruralized. For the rest, and firstly in so far as agriculture is concerned, I have pinned my faith firmly to owner-occupation for reasons which I have endeavoured to explain, and for this very important further reason. The whole tendency of to-day—an ever-increasing bureaucracy, huge combines, multiple shops—is towards the creation of salary and wage earners, the vast majority of whom must obey orders. To plan, moreover, implies not an inconsiderable measure of standardization, the obeying of orders all round, and the setting of limits to the independence of individuals. This carries with it undesirable and unfortunate consequences, the evils of which must as far as possible be mitigated. A large population of owner-occupiers on the land would make for a great measure of individual independence and initiative, and this despite the relentless enforcement of ever more stringent marketing and co-operative regulations.

To my mind three corollaries are implicit in a policy based on owner-occupation. Such a policy is antithetical to the nationalization of the land, and it is for this reason, and this only, that I must admit to feelings of abhorrence for the very idea of nationalizing the land. Everything that could be achieved by land nationalization can be achieved by other and less

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irrevocable means. The concern of the State is to safeguard the uses to which land is put, and to develop to the maximum the resources of the land. Compulsory powers of purchase and temporary ownership are necessary expedients to be adopted in the case of afforestation, and as one of the means available for the re-conditioning of large contiguous blocks of country in a derelict condition both as to the land and rural facilities. Such intervention on the part of the State is, however, an entirely different matter from the wholesale and permanent nationalizing of the land, and quite innocuous because not saddling posterity with a policy which it would be difficult, if not quite impossible, subsequently to rescind, and which would have stood as a permanent barrier against the adoption of other and more enlightened policies.

The second corollary is that owner-occupation on a grand scale would only be possible if supported by a State scheme of providing credit facilities for every purposeful activity connected with high farming, land reclamation and conditioning. In this connection my concluding remark shall take the form of a question. Which would be to the greater national advantage, the more easy to initiate and carry through, and in the end the least costly, the nationalization of the land or the provision of credit facilities on an appropriate scale and on a sound basis?

The third corollary implicit in a policy of owner-occupation is that we should produce all the food we can within our own shores. As to this matter I need only again insist that evidence is rapidly accumulating which indicates that the general standard of health and physique of the nation at large leaves alarmingly much to be desired. The chief cause, it becomes increasingly apparent, is under-nutrition and mal-nutrition: much too large a proportion of the population is not eating enough food nor is it eating the right food, and emphasis is ever more emphatically being placed on the absolute necessity of having the right food—fresh food, and, therefore, such as is produced at home.

I need not, I think, summarize the facts that I have brought forward relative to the present day condition of the land and the means that I have suggested for re-conditioning and re-suscitating the countryside. To do all this would also be implicit

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in a policy based on the furtherance of owner-occupation. I would only emphasize that I have insisted on various forms of State subsidy to individuals—subsidy in money and subsidy in kind—and that I want these subsidies to be so arranged that they react definitely to the good of the land; in the last resort it is the land and not commodities that should be subsidized.

With regard to what I have said about the urban population in the country, I would only ask my critics to go into the country during the holiday season to watch and to observe, and then to meet and talk to country people and to watch and observe again, and finally to consider the alternatives to the suggestions I have put forward. I believe only two alternatives are possible: either an indiscriminate growth of ribbon development, although probably in a slightly altered form: instead of ribbons drawn out all over the country we shall have a kind of spangled network of squares, oblongs and triangles. Or the great cities will gradually disintegrate and almost every village and hamlet—or the equivalent of every village and hamlet—will become a considerable town; in either event the country as country would be doomed, and the whole of Great Britain would be urbanized.

My proposals aim at saving the countryside, at keeping town and country separate, and at the same time giving the maximum of facilities to the urban population for enjoying the country and as far as possible earning a subsidiary income in the country. I attach the greatest possible importance to the psychological value of a subsidiary income earned in a creative enterprise—this, and, coupled with it, powers of compulsory purchase to be given where necessary to trade guilds in order to acquire estates and to municipalities in order to acquire land for (municipal) national parks, constituting perhaps the most essential features of my proposals as affecting the urban population.

I now come to a consideration of administrative ways and means, and to my final proposal, which calls primarily for the setting up of an additional State department—a Ministry of Lands. To-day, land utilization and the land itself are not the supreme care of any one State department. The Ministry of Agriculture (only mildly interested in the land itself), the Air Ministry (aerodromes), the Admiralty (harbours and munition works), the War Office (camps and munition works), the Ministry

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of Transport (roads and railways), the Ministry of Health (houses), and the Board of Trade (trade expansion) are all interested, and are all rivals for the use of land. There is no Government Department with an overriding authority or with a planning programme for the better and proper use of the land itself, and yet land is perhaps the only commodity of which this country has not recourse to an inexhaustible supply.

It is inconceivable that any country that had even the most rudimentary thought for posterity would permit itself to go floundering along with no State department keeping a firm hand and an eagle eye on its most precious asset, and one that is most easily squandered or abused. Some would place all new developments and planning in the hands of extra-Parliamentary development boards. To do so may be sound enough as an executive means of getting essential works and enterprises under way, but Parliament must retain co-ordinating and, if necessary, restraining powers. The more boards, commissions and State-aided voluntary associations that are set up to carry out individual aspects of a land policy, or of any policy the fulfilment of which would make demands on the land, the greater would be the need for co-ordination, and for some overruling authority with the power to say 'NO, that area of land you certainly must not use for such a purpose'.

On the other hand, it would be equally essential that the acquisition of land should be facilitated when that land is pre-eminently suited for a purpose that is in the national interest. A policy of owner-occupation would exaggerate the need of State control, already very great, and therefore the Ministry of Lands would have to be given drastic powers in this connection. A scheme of licensing the uses-to-which-land-could-be-put might be necessary, the licences to be renewed and reviewed at regular intervals: the precise licence appertaining to any particular parcel of land would constitute an overriding condition affecting sales. For if a farm (licensed as such) was sold, the purchaser could not use any part of the land for any purpose other than farming without a revision of the licence. Licences would only be revised after a full enquiry into all the conditions and circumstances affecting the case. All this would demand well-conceived legislation, but would not, I believe, present insuperable

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difficulties, while those who own land cannot have it both ways—there must be nationalization of the land or drastic State powers to ensure that land is utilized only to the best advantage.

Politically there would be the strongest divergence of opinion as between a policy of owner-occupation *cum* land licences *cum* credit facilities and the nationalization of the land, and the issue is one that I should like to see fairly and squarely put before the country, and debated without the artificial heat engendered by political controversy and in an atmosphere cleansed of the enervating influences of pre-conceived notions.

At the end of a book that has run to much greater length than I had intended I need not, I think, endeavour to draw up a charter for a Ministry of Lands. That should not present difficulties, for the term of reference is clear-cut, while the precedent for the formation of new departments is well established, and with such definite duties to perform, it should not be difficult to decide upon the particular branches of the Ministry of Agriculture (Land Drainage, for example) and of the other existing Ministries which should be taken over *in toto* or in part by the new Ministry. The Ministry of Lands would be ultimately the responsible department for the preparation of the new Domesday Book (an essential document with a view to licensing the uses to which land could be put) and would be the parent department concerned with legislation and regulation relative to National Parks, Trade Guild Estates, Land Settlement and Week-End Allotment Associations. Traffic *qua* traffic and road safety should remain the care of the Ministry of Transport, but the care of roads and the roads in general should be transferred to the Ministry of Lands, which would set up a central main road authority which would also be charged with questions relating to quarrying for road material and for lime for agricultural purposes.

Perhaps the most important duties of the Ministry of Lands would be those connected with housing developments and with the legislation necessary to control and foster the provision of rural facilities in general. Where the land is involved, perhaps more than in the case of any other matter which is the concern of the State, it is essential to think centrally, regionally, and locally, and to see all the interrelations at a glance—hence, incidentally, the immense importance of a proper survey

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committed to a map. From the point of view of administration, nothing is so important as a carefully graded system of decentralization with a firm central thread connecting it all the way from Whitehall to the remotest rural parish. Certain programmes must be put into operation, but they must be fulfilled according to local conditions; in one way in one parish, and in another in a different parish. Progress is to be fostered perhaps not so much by the initiation of a great many different activities as by setting out to attain a particular end of fundamental importance by a great many different means, and where the country is concerned much stress should be placed on the regional and local necessity of adopting different methods. This can only be achieved by decentralization and by allowing a great deal of latitude to the final executive authority, but always that authority must conform to the broad requirements of a programme, and must, therefore, be subject to control from Whitehall. Municipal, county and local authorities should not be given a completely free hand where the land is concerned, and that I believe to be a fundamental principle in relation to any attempts to control and direct land utilization to the best advantage of the State and of posterity.

The weakest section in the frequently bifurcating road along which decentralization must travel is the wide gap between Whitehall and the counties with their county, rural, municipal and borough authorities. I would not go so far as to suggest that the County Councils, Rural Councils, Municipal Corporations, and Borough Councils are effete and time-expired, but the point I would stress is that not only regional co-ordination but regional administration has become a prime necessity. A region must be a homogeneous and organic unit—a unit which would owe no allegiance to county boundaries. When the Domesday Book has been compiled, and the survey completed, the scientific regionalization of Great Britain would follow automatically—perhaps eight, perhaps twelve, regions. Then Regional Councils, which in the hierarchy of local government would stand somewhat in the relation to the County Councils which the County Councils do to the Urban and Rural Councils. In due time the Regional Councils would perhaps completely supersede the County Councils.

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One example of the benefits of regionalization has been the setting up of regional advisory (scientific) centres in connection with agriculture, a plan which has been fruitful of much good, despite the looseness and lack of proper cohesion in the organization of the scheme as a whole. The initiative has rested too much with the periphery and not sufficiently with the centre, and such must always be the case in efforts at regionalization where the larger circle has not been endowed with an overriding authority over the smaller. The proper administration of the affairs of the country, having chief regard to the use which is made of the land, can only be organized by a carefully graded system of what I shall describe as centralized-decentralization—Whitehall, Regional Councils, County Councils, Urban and Rural Councils.

I have made a considerable point of district commissioners, and I think any well-conceived plan of graded decentralization would turn largely on the employment of district commissioners endowed with considerable powers and not a little latitude in action, themselves under direct orders from Whitehall though based on the regional centres.

I have brought together a large mass of facts; I have expressed many opinions, and made a number of concrete proposals. As I have said before, not one of my proposals is in essence new, and yet in the aggregate they perhaps suggest possibilities of a new and happier England. An England which I fear to many can only be pictured as a figment of the imagination, as something that can be dreamed of perhaps but never made a reality. I am not sure, for the country as a whole is more land conscious than it has been for many a long day. If my book only encourages further dreaming and imagining about the land it will have more than served its purpose, for deep in the inner recesses of man's sub-conscious mind lies the indelible impression of the land—a heritage which, by greatly dreaming and greatly imagining, could be galvanized into a mighty power, capable of strengthening the conscious endeavours of mankind and directing them along paths leading to creative achievement in the spheres of individual happiness, personal health and social justice.

APPENDIX

Bibliography

In a book of this sort I should, I suppose, have given detailed references to all my sources of information—such references are very tiresome, although they do give to a book a certain air of academic rectitude. Because I wanted this book to appeal to the general reader, I have been anxious to avoid the academic. I have, however, been equally anxious to avoid inaccuracy. I do desire most profoundly to make acknowledgment to the authors and authorities I have drawn upon, and I trust that mention of the various works in this bibliography will be accepted as such acknowledgment. For convenience I have arranged the bibliography on a chapter basis, and I have included as well as the works from which I have obtained statistical and other direct information all the publications which I have consulted in the preparation of this book. Amongst the latter are a certain number of works of a non-technical nature which bear indirectly upon the subjects that I have brought under discussion. Each reference is placed under the chapter to which it more particularly appertains; where necessary I have repeated references in subsequent chapters.

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